

On the Nature of Island Constraints. I: Language Processing and Reductionist Accounts

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1. The Challenge of Island Effects

Natural language grammars would probably be simpler if there were no island constraints. They are obscure, often complex, and they present a potentially daunting challenge for language learners, since it is far from clear how children could correctly figure out the details of island constraints based on the limited input that they receive. It probably does not help that island constraints apply to constructions that are already somewhat complex, raising the danger that children might misanalyze the input. It is not surprising, then, that island constraints have been regarded as strong motivation for innate domain-specific constraints on language, i.e., for Universal Grammar.

Over the past 40 years this general view has received broad (though not remotely unanimous) agreement in linguistics, and there have been many attempts to characterize the innate linguistic constraints that could account for island effects (Chomsky 1964, 1973, 1986; Ross 1967; Huang 1982; Rizzi 1990; Lasnik & Saito 1992; Manzini 1992; for reviews see Szabolcsi & den Dikken 1999; Boeckx 2008). This has spawned a wealth of new discoveries in diverse languages, not to mention many new discoveries in languages as familiar as English. These new discoveries have led to important generalizations about cross-language parallels, but also no shortage of challenges for advocates of innate island constraints. The facts of island constraints have turned out to be richer than originally suspected. Despite talk of a quest for ever simpler theories, formal theories of island constraints have tended to become more complex.

The innateness argument relies on the claim that island effects reflect grammatical constraints, and that those constraints are not learnable from the input that a child receives. This suggests two alternatives to the search for innate linguistic constraints.¹ First, one can try to show that island effects do not reflect grammatical constraints. Second, one can try to show that island constraints can be learned from the sentences that a child hears. The first of these approaches has a long tradition. Almost since the discovery of island effects in the 1960s there have been attempts to eliminate island constraints from grammatical theories, by reducing them to independently motivated constraints on language processing, pragmatics, or information structure. According to such *reductionist* accounts, island effects are epiphenomena, and their consequences can be explained without recourse to formal grammatical constraints on extraction from islands. The reductionist approach has generally been regarded as the most viable alternative to innate island constraints, but a recent computational learning model instead pursues the second alternative. Pearl and Sprouse (submitted, this volume) argue that island constraints can, in

¹ A third alternative is to question whether island effects are real, and hence whether there is anything to be explained (note that this is quite different than questioning whether island effects reflect formal grammatical constraints). I do not consider this skeptical position in any detail here, as I think that the evidence for basic island phenomena is sufficiently robust to not be in serious doubt.

fact, be learned from the input using simple distributional analyses and no innate linguistic constraints.

Both of the alternatives to innate linguistic constraints have many attractions. If either of them is successful, then they remove a sizeable burden from accounts of language evolution. Both of them also hold the promise of simpler grammatical theories, though for different reasons in the two cases. Reductionist accounts straightforwardly simplify grammars, by removing island constraints from them. Meanwhile, if island constraints are learnable from the input, then clearly they remain a part of the mental grammar. But a demonstration of the learnability of island constraints could be beneficial in a different way: the grammatical machinery of individual languages might be simplified if it no longer needs to be a part of a system of principles and parameters that has to account for all languages. Of course, the attractiveness of these possibilities has little bearing on whether innate, formal island constraints can ultimately be dispensed with. Sometimes nature is not so kind.

In this first of two chapters I survey the current status of evidence on island constraints and language processing, and discuss the feasibility of a reductionist account. In the second chapter I focus on island constraints and language learning, and examine the scalability of Pearl and Sprouse's distributional learning model. In both cases I argue that the motivation for formal/innate linguistic constraints remains solid, and that the alternative approaches help to clarify this motivation.

In Section 2 of this chapter I briefly survey the scope of island effects and some leading formal and reductionist accounts. I emphasize that a successful account of islands must capture far more than the basic English effects discovered in the 1960s. In Section 3 I discuss some psycholinguistic findings that are sometimes used as evidence in favor of either a formal or a reductionist account, but that I take to be consistent with either approach. In Section 4 I discuss a series of challenges for reductionist accounts of islands, and Section 5 points out some important challenges for formal grammatical accounts. Section 6 concludes.

I should emphasize at the outset that I have no interest in making a general argument against reductionist accounts of linguistic phenomena, or in broadly questioning the utility of distributional learning. I have advocated for reductionist accounts of some linguistic phenomena (cf. Phillips 2011), and I believe that distributional learning is an essential component of language acquisition. My arguments here are specifically about island effects; other linguistic phenomena should be addressed on a case-by-case basis. And my arguments about distributional learning are specifically about whether it removes the need for innate island constraints; this leaves open the possibility that distributional learning could be very useful for the learner in combination with a constrained hypothesis space.

2. The Scope and Origin of Island Effects

2.1. The scope of island effects

2.1.1. (Un)bounded dependencies and islands

Sentences encode relations between a wide range of morphemes, words, and phrases. Grammars specify the range of possible relations. Some relations are very local, others less

so. For example, English verbs and their direct objects generally must be adjacent (1), and they can be separated from one another only in extreme situations, such as when the direct object is phonologically 'heavy', in which case it can be shifted rightwards (2). This is an example of a dependency that is local, both structurally and linearly.

- 1 a. Wallace ate the cheese.
b. *Wallace ate eagerly the cheese.
c. *Wallace ate in his living room the cheese.
- 2 a. *Wallace drank eagerly it
b. *Wallace drank eagerly the tea.
c. Wallace drank eagerly the tea that he had been dreaming about all night.

Subject-verb agreement in English involves a relation that is structurally local, although the agreeing nouns and verbs may be linearly separated by many intervening words (3). I use subscript indices to indicate words and phrases that form a linguistic dependency.

- 3 a. Wendolene_i hates_i cheese.
b. The woman_i that owns the wool shop in the high street hates_i cheese.

In contrast, many linguistic phenomena create relations that are far less local. The relation between *wh*-phrases and their associated verbs are not unique in terms of the distances that they allow, but they have attracted special attention and are often referred to as *unbounded dependencies*. In the transformational grammar literature they are often referred to with the unfortunately opaque cover term *A'* ('*A-bar*') *dependencies*. In the psycholinguistic literature they are more commonly known as *filler-gap dependencies*. A fronted *wh*-phrase in English may be separated from the verb that selects it by zero, one, two, or arbitrarily many clauses (4). In these and subsequent examples an underline is used to indicate the gap corresponding to the canonical position of the fronted *wh*-phrase. This device is used for illustrative purposes, with no intended commitment to the proper mental representation of unbounded dependencies.

- 4 a. What does Wendolene like ___?
b. What does Wallace hope that Wendolene likes ___?
c. What does Gromit think that Wallace hopes that Wendolene likes ___?
etc.

Island effects are interesting because they show that unbounded dependencies are, in fact, bounded in some circumstances. Although a *wh*-phrase may be extracted across multiple embedded clause boundaries, as shown in (4), there are a number of syntactic environments where extraction is reliably judged to be unacceptable. This includes relative clauses (5a), and other types of complex noun phrases, such as definite nouns with complement clauses (5b) and nouns with possessors and prepositional phrase complements (5c). It also includes interrogative clauses headed by *whether* or other *wh*-phrases (5d-e), subject and adjunct clauses (5f-g), coordinate structures (5h), factive clauses (5i), and negative clauses (5j). In the last two examples the relevant interpretation

that is excluded is the one in which the interrogative word *why* is interpreted as modifying the embedded clause.

- 5 a. *What did Wallace meet a woman [rel. cl. that hates ___]?
- b. *What did John read the report [that Craig won ___]?
- c. *Who did Robyn believe [Simon's news about ___]?
- d. *What did Sue wonder [whether Joe wrote ___]?
- e. *What does Helen know [who saw ___]?
- f. *What did [the fact that Ellen remembered ___] surprise her children?
- g. *Who did Susan watch TV [while talking to ___ on the phone]?
- h. *What did [the Senate approve ___] and [the House reject the bill]?
- i. *Why did they remember that the corrupt CEO had been acquitted ___?
- j. *Why did they say that nobody left ___?

These domains in which unbounded dependencies are blocked have been known as 'islands' since seminal work by Ross (1967). In what follows I use the term *island effects* to refer to the basic phenomena, independent of their ultimate source, and I use the term *island constraints* to refer to formal linguistic accounts of those effects. One could, in principle, simply assume that speakers' mental grammar contains a long list of separate island constraints, each of which specifies an individual construction that disallows unbounded dependencies. But since the discovery of island effects there has been broad agreement among linguists that an arbitrary list of this type is unsatisfying, and this has led to many attempts to build a more general account of island effects, reducing them to a small set of abstract constraints on unbounded dependencies (Chomsky 1964, 1973, 1986; Rizzi 1990; Lasnik & Saito 1992; Manzini 1992; for reviews see Szabolcsi & den Dikken 1999; Boeckx 2008).

2.1.2. Diversity of application

Island effects are commonly illustrated using *wh*-dependencies, but their effects can be seen across a wide range of other constructions. This diversity of application is important, because any account of island effects should capture how the effects extend across the full range of constructions.

In addition to *wh*-dependencies (6a-b), island effects can be observed in relative clauses. Like *wh*-fronting, relativization can span multiple clauses (7a), but relativization across another relative clause boundary (7b) or from a *wh*-clause (7c) is not possible. Similar effects can be seen in topicalization constructions. Topicalization may cross clause boundaries (8a), making it qualify as an unbounded dependency, but topicalization out of a relative clause (8b) or an adjunct clause (8c) is impossible. In languages that make productive use of so-called *scrambling* operations, such as Japanese and Hindi, similar island effects are often found (Saito 1985; Mahajan 1990).

- 6 a. What did the journalist accuse a man of stealing ___?
- b. *What did the journalist accuse a man who stole ___?

- 7 a. This is a painting that the journalist accused a man of stealing ___?
 b. *This is a painting that the journalist accused a man who stole ___?
 c. * This is a painting that the journalist knows who stole ___?
- 8 a. Those chapters, most students agree that you can safely skip ___.
 b. *Those chapters, most students discovered a web site that summarizes ___.
 c. * Those chapters, most students know how to pass the exam without reading ___.

It is perhaps unsurprising that the constructions in (6-8) exhibit similar island effects, since they all transparently involve displacement of one phrase from its canonical position to a sentence-initial or clause-initial position. But island effects extend to other phenomena that less obviously involve displacement operations, such as adjective-*though* constructions (9) and comparatives (10). Nevertheless, it is easy to identify the gap created by these constructions, and the island-sensitivity of these constructions is straightforwardly captured by analyses that treat them as involving fronting of a *wh*-operator. The operator is typically phonologically null, but sometimes surfaces overtly in certain dialects/registers (11).

- 9 a. Smart though I think that John is __, I don't trust him to analyze that data.
 b. *Smart though I wonder whether John is __, I trust him to analyze that data.
- 10 a. Mary isn't as fast as [John believes she was __ five years ago]
 b. *Mary isn't as fast as [John remembers who was __ five years ago]
- 11 Mary isn't as fast as [what she was __ five years ago]

The diversity of constructions that exhibit island effects is important, as it shows that any successful account of the grammar, processing, or learning of island effects must extend to more than just *wh*-questions and relative clauses.

2.1.3. Diversity of realization

The constructions reviewed in the previous section all share the property that one phrase fails to appear in its canonical position. As such, it is tempting to regard island effects as properties of missing phrases or gaps in syntax. However, such an account would be too narrow, as island effects can be seen in a wider range of situations. Island effects can also be seen in languages with *wh*-in-situ constructions. These are constructions in which a *wh*-phrase appears in its canonical argument position. In some of these languages the scope of the *wh*-question is marked via an interrogative particle that appears on the verb of the clause where the *wh*-phrase takes scope. (12) shows two examples of in-situ *wh*-questions in Japanese. In both examples the *wh*-phrase is the embedded clause direct object. But the two sentences have different interpretations, due to the differing positions of the interrogative particle. The main clause interrogative particle in (12a) indicates that the sentence is interpreted as a direct question. The embedded clause interrogative particle in (12b) indicates that the sentence is an indirect question. These examples illustrate the important point that *wh*-questions involve long-distance dependencies, even when the

wh-phrase is not fronted, as it is still necessary to link the thematic and scope positions of the *wh*-phrase. The scope is marked by overt question particles in languages like Japanese, but there are other *wh*-in-situ languages, such as Chinese, that do not mark the scope of questions overtly.

- 12 a. John-wa [Mary-ga dare-ni sono hon-o ageta-to] itta-no?
John-top Mary-nom who-dat that book-acc gave-Comp said-QP
 ‘Who did John say Mary gave a book to?’
- b. John-wa [Mary-ga dare-ni sono hon-o ageta-ka] itta.
John-top Mary-nom who-dat that book-acc gave-QP said
 ‘John said who Mary gave that book to.’

The status of island effects in *wh*-in-situ constructions varies across languages. The most well-known descriptions come from languages like Chinese and Japanese, which are described as not showing island effects for in-situ argument *wh*-phrases, but showing clear island effects for in-situ adjunct *wh*-phrases (Huang 1982; Lasnik & Saito 1984, 1992). (13) illustrates this contrast in Chinese. Both (13a) and (13b) have two in-situ *wh*-phrases, and both allow a reading in which the first *wh*-phrase takes matrix clause scope and the second takes embedded scope. Importantly, however, the reading in which the second *wh*-phrase crosses over the first one to take matrix scope is possible for the argument *wh*-phrase in (13a) but not for the adjunct *wh*-phrase in (13b).

- 13 a. [ni xiang-zhidao [shei mai-le sheme]]
 you wonder who buy-ASP what
 ‘Who_i do you wonder what_j ____i bought ____j?’
 ‘What_i do you wonder who_j ____j bought ____i?’
- b. [ni xiang-zhidao [shei weisheme mai-le shu]]
 you wonder who why buy-ASP book
 ‘Who_i do you wonder why_j ____i bought books ____j?’
 * ‘Why_i do you wonder who_j ____j bought books ____i?’

The distribution of island effects in Chinese and Japanese *wh*-in-situ has been particularly well studied, but other languages show less well-known patterns that are either more restrictive or less restrictive. For example, Ancash Quechua *wh*-in-situ appears to lack island effects for arguments and adjuncts alike (Cole & Hermon 1994), whereas Hindi *wh*-in-situ displays island effects for both arguments and adjuncts (Malhotra 2009). It is generally assumed that these cross-language differences do not reflect arbitrary variation, but instead reflect different underlying syntactic mechanisms, but it remains unclear what is responsible for these differences.

Although English is typically described as a *wh*-fronting language, it exhibits only a limited form of *wh*-fronting. This becomes apparent when we consider cross-linguistic variation in the form of multiple *wh*-questions, i.e., questions in which more than one phrase is questioned. In English and many other languages only one *wh*-phrase is fronted in such questions, with additional *wh*-phrases remaining in-situ (14). In contrast, languages

such as Russian, Polish, Bulgarian, and Romanian form such questions via fronting of all *wh*-phrases, as shown by the Bulgarian example in (15), in which two *wh*-phrases have been extracted from an embedded clause (Rudin 1988).

- 14 a. Who bought which books?
 b. Which groceries did Mary tell John to buy where?

15 Koji kŭdej misliš [CP če e otišŭl ___i ___j]
who where think.2s that has gone
 'Who do you think that went where?'

Interestingly, English and Bulgarian show close parallels in the effects of island constraints on additional *wh*-phrases (Richards 2001). (16a) illustrates the familiar ban on extracting a *wh*-phrase from an adjunct in English. But (16b) shows that in a multiple *wh*-question where the second *wh*-phrase remains in-situ inside the adjunct, the island effect is absent. This lack of an island effect for an in-situ argument *wh*-phrase is similar to findings for in-situ *wh*-phrases in languages like Chinese. However, exactly the same contrast holds in single vs. multiple *wh*-questions in Bulgarian, despite the fact that no *wh*-phrases remain in-situ (17).

- 16 a. *Who does John want to say a prayer [before we interview ___] ?
 b. Who wants to say a prayer [before we interview who] ?

17 a. *Kogo_j iska Ivan da kaŭe molitva [predi da intervjuirame ___j] ?
who wants Ivan to say prayer before we-interview
 b. Koji kogo_j ___i iska da kaŭe molitva [predi da intervjuirame ___j] ?
who whom wants to say prayer before we-interview

Richards argues that the facts in (16-17) reflect a general restriction that 'subjacency' effects such as adjunct islands apply to the first *wh*-phrase in a sentence but not to additional *wh*-phrases. But the examples make a more general point: the acceptability of extracting the second *wh*-phrase *kogo* in (17b) shows that it is possible, in principle, to form *wh*-dependencies that span island boundaries. This implies that an account of the ill-formedness of (16a) and (17a) should rely on mechanisms that are sufficiently narrow to not apply to (17b).

2.1.4. *Escape from islands*

There are a number of circumstances where island effects are attenuated or eliminated, due to properties of the extracted element or the extraction site.

First, it has long been noted that some island effects are attenuated when the extracted *wh*-phrase is *specific*, i.e., when the question indicates that the possible answers are drawn from a pre-determined set of alternatives. When a simple *wh*-phrase is extracted from a *whether* clause the result is generally low acceptability (18a), but when the bare *wh*-phrase is replaced by a more complex *wh*-phrase such as 'which of those books' that highlights a

specific set of alternative answers, the result is typically judged to be more acceptable (18b) (Karttunen 1977; Pesetsky 1987; Rizzi 1990). However, specificity does not uniformly rescue island violations. It tends to have a noticeable effect on relatively mild islands, but it has a less obvious effect on more ‘severe’ islands, such as the *wh*-island in (19)² and the relative clause island in (20). This variability in the effect of specificity is less easy to capture in an account that claims that specific *wh*-phrases form different types of grammatical dependencies than non-specific *wh*-phrases (Pesetsky 1987; Rizzi 1990), and it lends itself to a resource-based account of the specificity effect (Hofmeister & Sag 2010).

- 18 a. *What do you know whether John read ___?
b. Which of those books do you know whether John read ___?
- 19 a. *What do you know who bought ___?
b. *Which of those books do you know who read ___?
- 20 a. *What do you know the man who wrote ___?
b. *Which of those books do you know the man who wrote ___?

A second type of escape from island constraints arises in a phenomenon known as *parasitic gaps* (Engdahl 1983; Culicover & Postal 2001). These are constructions in which a single *wh*-phrase is associated with multiple gaps in a sentence, one of which is inside an island, and one of which is not. Strikingly, the combination of a ‘good’ gap with a ‘bad’ gap yields a result that is acceptable. This is illustrated for subject islands and adjunct islands in (21) and (22). The first example in each set illustrates a regular island violation, and the second example illustrates the acceptability of the gap that does not violate an island constraint. The third example in each set shows that the combination of the two gaps is acceptable. The gap inside the island is described as a ‘parasitic’ gap because its acceptability depends on the presence of the other gap. Linguists have sometimes described parasitic gaps as a marginal phenomenon, but controlled judgment experiments confirm that they are very real, with examples like (21c) and (22c) receiving ratings that are very close to the examples in (21a) and (22a) (Phillips 2006; Wagers & Phillips 2009).

- 21 a. *What did [the attempt to repair ___] ultimately damage the car?
b. What did [the attempt to repair the car] ultimately damage ___?
c. What did [the attempt to repair ___] ultimately damage ___?

² An example almost identical to (19a) was marked without an asterisk in Chomsky (1986, p. 48), and this has recently been the focus of a critique of informal acceptability judgments in linguistics (Gibson & Fedorenko in press). This discussion is unfortunately misleading. Chomsky did not claim that (19a) was acceptable. The example arose in a discussion of an analysis of (19a) that predicted it to be fully acceptable. In that analysis the embedded clause subject *who* remains in-situ, and therefore fails to block successive cyclic movement of *what* to the main clause. Chomsky recognized this to be an inappropriate prediction. Therefore, the ‘vacuous movement’ of the embedded subject that Gibson and Fedorenko describe as Chomsky’s justification for the acceptability of (19a) is, in fact, the opposite. It is a mechanism that he specifically sought to block, in order to capture the unacceptability of (19a). The original text is certainly not as clear as it could be, nor is the annotation of the example sentences, but the ‘dispute’ over the status of (19a) is a fiction. Also, to my knowledge there have been no significant theoretical claims that have relied on the acceptability of (19a). This includes the theory in Chomsky (1986).

- 22 a. *What did the student read the textbook [without understanding ___]?
b. What did the student read ___ [without understanding a thing]?
c. What did the student read ___ [without understanding ___]?

Parasitic gap phenomena are interesting in their own right, as it is far from obvious that the combination of a good gap and a bad gap should yield a result that is acceptable. But they are also interesting more generally for accounts of island effects, as they show that any account that applies uniformly to all cases of gaps inside island domains is unlikely to succeed. They are discussed further in Section 4.2.

A third type of ‘escape’ from island constraints arises in various cases of sentences that appear to show the characteristic structure of island violations, yet intuitively sound quite acceptable. (23) illustrates examples of apparently acceptable Complex NP Constraint violations (Deane 1991; Ross 1967) and a Coordinate Structure Constraint violation (Goldsmith 1985).

- 23 a. Nixon was one president that they had no trouble finding votes for the impeachment of ___.
b. Which reports does the government prescribe the height of the lettering on ___?
c. How much can you drink ___ and still stay sober?

I return to a discussion of examples like these in Section 5.1.

2.1.5. *Cross-linguistic variation in island effects*

Cross-language variation in island effects is very important theoretically. To a first approximation, island effects are relatively consistent across the languages of the world. The same types of structures and constructions tend to induce island effects in language after language, and cross-language surveys typically yield few surprises. For example, relative clauses and subject clauses are commonly island domains, and it is surprising to find a language in which subject clauses exhibit island effects but relative clauses do not. But the cross-language similarities extend only so far, and there are numerous instances of specific cross-language differences in island effects, at least in terms of permissible surface forms. This variability is important from a learning perspective, as it challenges the claim that island constraints do not need to be learned because they are universal and innate. It is also important for debates about the nature of island effects in adult speakers, as formal grammatical accounts and reductionist accounts are differentially able to accommodate cross-language variation.

Here I give a non-exhaustive list of seven cases of cross-language variation in island effects. A number of these cases are taken up again either below or in the companion paper on learning of island constraints. An important preliminary observation is that cross-language variation in island effects is constrained and systematic. For example, it is hard to find languages in which *wh*-fronting simply lacks island effects. However, current understanding of the causes of variation in islands is incomplete. In some instances the systematicity of the variation has been successfully linked to independently motivated linguistic properties, and in other instances it has not. In discussing cross-language

differences in island effects it is useful to distinguish between *deep variation in islands*, i.e., cases where languages appear to show genuine variation in island constraints, and *surface variation in islands*, i.e., cases where a language allows sentences that appear to violate island constraints, but where this most likely reflects an alternative structural representation that merely yields the appearance of an island violation.

A. *Complementizer-trace effects*. English and Italian differ in the acceptability of complementizer-trace effects. In English a *wh*-question in which the gap follows the complementizer *that* is generally unacceptable (24a) (Perlmutter 1971), but the corresponding sequence in Italian is fine (24b). This contrast has been studied in some detail, and it is generally regarded as an instance of surface variation, rather than reflecting deeper variation in the complementizer-trace constraint itself. Italian allows post-verbal subjects (24c), and so strings that have the appearance of complementizer-trace violations can be generated with a post-verbal gap that does not violate the constraint, as illustrated in (24b). The connection between post-verbal subjects and complementizer-trace effects is well justified across languages (Rizzi 1982; Brandi & Cordin 1989; Kenstowicz 1989; Roberts & Holmberg 2010), and this variation is discussed further in Section 4.5 below and in the companion paper.

24 a. *Who did you say that __ wrote this book?

b. Chi_i hai detto che ha scritto questo libro ___i?
 who have.2sg said that has written this book

c. Hanno telefonato molti studenti.
 have.3pl called many students

B. *Escapable relative clauses in East Asian languages*. Another cross-language difference that likely reflects surface variation can be found in apparently ‘escapable’ relative clauses in Chinese, Japanese, and Korean. Japanese example (25b) is an example of a double relative clause, in which the head of the higher relative clause *sinsi* ‘gentleman’ appears to be extracted from the lower relative clause, violating the normally strong islandhood of relative clauses. But there is good evidence in each of the three languages that sentences like (25b) do not, in fact, involve a *wh*-dependency that crosses a relative clause boundary (Sakai 1994; Han & Kim 2004; Hoshi 2004; Hsu 2006; Ishizuka 2009). Instead, (25b) is a relativization from a so-called *Major Subject Construction* (25a), an independently motivated construction in these languages in which a noun phrase outside a relative clause binds a null subject inside the relative clause. As a consequence, (25b) involves only local extraction. This account is supported by the fact that only a subclass of relative clauses allows apparent extraction like (25b). That subclass is defined by the same regularities that characterize major subject constructions. This phenomenon is discussed further in Section 4.5 and in the companion paper.

25 a. [_{IP} sono *sinsi*_i-ga [_{NP} [_{CP} *pro*_i ___j kiteiru] [_{yoohuku}_j]]-ga yogoreteiru]
 that gentleman-NOM pro wearing-is suit-NOM dirty-is
 ‘That gentleman is such that the suit that he is wearing is dirty.’

- b. [_{CP} Op_i [_{IP} _i [_{NP} [_{CP} pro_i _j kiteiru] yoohuku_j]-ga yogoreteiru] [sinsi_i]]
 Op pro wearing-is suit-NOM dirty-is gentleman
 'The gentleman who the suit that he is wearing is dirty.'

C. Escapable relative clauses in Scandinavian languages. In discussions of island constraints one sometimes encounters the suggestion that Swedish and other Scandinavian languages lack island effects, or broadly allow extraction from relative clauses. This is an overstatement. There are certainly examples in Scandinavian languages of acceptable extractions from relative clauses, such as Swedish (26a), and such examples are reported to be easy to find in corpora of naturally occurring speech (Allwood 1982; Engdahl 1982, 1997; Erteschik-Shir 1973; Nordgaard 1985; Taraldsen 1982). However, it is not possible to extract from all relative clauses, and many other cases of extraction from relative clauses in these languages are just as unacceptable as their English counterparts (Allwood 1982; Engdahl 1997). In a recent study Kush (2011) argues that the escapable relative clauses like (26a) are in fact instances of a different construction in Swedish that he likens to small clauses in English or pseudo-relatives in Romance languages (Cinque 1995; Rafel 2000). Kush shows that when this alternative structural parse is blocked, such as by using a different main clause verb (26b), then familiar restrictions on extraction from relative clauses reemerge.

- 26 a. Den teorin känner jag ingen som tror på.
That theory know I nobody that believes in
 'That theory, I know nobody who believes in.'
- b. *Den här teori, finns det ingen som tror på.
'That theory, one finds nobody who believes in.'

The Scandinavian cases are not yet as well understood as the escapable relative clauses in East Asian languages, but it is plausible to regard them as another example of surface variation in island effects.

D. 'Subjacency Parameter' effects. An influential early proposal about cross-language variation in island effects is due to Rizzi (1982), who pointed out that Italian appears to allow extraction from *wh*-islands that is disallowed in English (27-28). Similar observations have been made in French (Sportiche 1981) and Spanish (Torrego 1984). Rizzi proposed that this is due to parameterization of Chomsky's (1973) *subjacency principle*, which blocks *wh*-dependencies that cross more than one *bounding node*. Chomsky proposed that the bounding nodes for English are NP and S (= IP), explaining the unacceptability of (27). Rizzi suggested that the acceptability of (28) could be explained if in Italian the bounding nodes are instead NP and S' (= CP).

- 27 * What_i do [_{IP} you wonder [_{CP} who_j [_{IP} _j likes _i]]?
- 28 Tuo fratello, [_{CP} a cui_i mi domando [_{CP} che storie_j abbiamo raccontato _i _j],
 your brother, to whom I wonder which stories they-have told,
 era molto preoccupato
 was very worried

Rizzi's account of this cross-language contrast suggests that it is a case of deep variation in island effects, where the two languages genuinely obey different restrictions. However, the status of this contrast is uncertain, and it has been claimed that English is not so different than Italian (Grimshaw 1986).

E-F. Variability in subject and adjunct islands. Further examples of apparent deep variation in island effects involve subject and adjunct islands. Extraction from complex subjects is generally degraded-to-unacceptable in English and many other languages, but there are languages in which this is possible. For example, Stepanov (2007) shows examples of licit subject extraction from Russian (29), Hungarian (Kiss 1987), Palauan (Georgopoulos 1991), and other languages.

29 a. *What do you wish that [to buy ___] would be no trouble at all.

b. Cto by ty xotel ctoby kupit' ne sostavljalo by nikakogo truda?
 what SUBJ you wanted that-SUBJ to-buy not constitute SUBJ no labor
 'What would you want that [to buy ___] would not be any trouble?'

Similarly, Yoshida (2006) documents cross-language variation in the islandhood of adjunct conditional clauses. (30) shows one such example from Korean, together with its English counterpart. Japanese and Malayalam are among the languages that show similar behavior to Korean in this area, while languages like Russian, Spanish, and Basque behave like English. Like the cross-language differences in subject islands, this specific case of variation remains poorly understood.

30 Etten-haksayng-hanthey_i Quinn-un [manyak Virginia-ka ____i
 which student-DAT Quinn-TOP COND-ADV Virginia-NOM
 senmwul-ul cwu-myen wul-ul-ka?
 present-ACC gave-COND cry-will-Q
 '*Which student will Quinn cry if Virginia gives a present to ___?'

G. Islands in wh-in-situ constructions. As already discussed above in Section 2.1.3, languages that use a *wh*-in-situ strategy for forming *wh*-questions show varying effects of island constraints. The most well-known profile is the one found in languages like Chinese and Japanese, where argument *wh*-phases tend not to show island effects but adjunct *wh*-phrases do. But there are also languages like Hindi that show more widespread island effects for *wh*-in-situ than do the East Asian languages (Malhotra 2009), and languages like Quechua that show few island restrictions on *wh*-in-situ (Cole & Hermon 1994). It appears, therefore, that *wh*-in-situ phenomena exhibit a degree of variation across languages that we do not encounter in *wh*-fronting phenomena. *Wh*-fronting is broadly constrained by islands, but many languages show exceptions in individual phenomena, often affecting just one type of island, or reflecting surface variation due to the existence of alternative structures. We tend not to find languages that simply lack island effects for *wh*-fronting

across the board. In contrast, *wh*-in-situ phenomena do seem to sanction the possibility of fully obeying or escaping island effects.³

A standard approach to the variability in *wh*-in-situ phenomena is to assume that languages can avail themselves of different syntactic mechanisms for forming dependencies with in-situ *wh*-phrases, and that only some of these mechanisms involve the *wh*-dependencies that are subject to island constraints. For example, dependencies involving null resumptive pronouns instead of gaps may escape islands. This is the most promising approach to the variation that I am aware of. It is preferable to the claim that some languages simply lack island constraints, since a language may show island effects for one in-situ construction but not for another. For example, in Quechua *wh*-in-situ constructions do not show island effects, but internally-headed relative clauses do show island effects (Cole & Hermon 1994). However, it remains poorly understood why languages should choose different mechanisms for encoding *wh*-in-situ, and how a learner could identify which mechanism is used in the target language.

2.2 Formal grammatical accounts of island effects

By far the largest body of work on island effects has assumed that they are consequences of formal grammatical constraints that block displacement operations that remove phrases from island domains. Most work in this tradition has simply assumed the formal grammatical approach without considering alternative conceptions, and the primary aim of this work has been to explain the diversity and variability in island effects reviewed above in terms of a limited number of abstract constraints.

In an early attempt to capture island effects Chomsky (1964) proposed the *A-over-A Principle*, which blocked a phrase from being extracted out of another phrase of the same category, e.g., an NP cannot be extracted from another NP. It quickly became clear that this constraint was both too narrow and too broad (Ross 1967). In a well-known attempt to unify a number of different island effects Chomsky (1973) proposed the *Subjacency Principle*, which ruled out extractions that cross more than one *bounding node*, where the bounding nodes correspond to NP and S. This constraint was coupled with the proposal that unbounded dependencies involve *successive cyclic* movement of the extracted phrase from one clause to the next, passing through the CP-specifier position of each clause. In this way *wh*-dependencies that appear to be very long are assumed to involve multiple one-clause dependencies, each of which conforms to the Subjacency Principle. A number of subsequent phenomena have since been uncovered that may be analyzed as overt reflexes of successive cyclic *wh*-movement (Chung 1982; Clements 1984; Torrego 1984; McCloskey 1989, 2000).

Later work sought to provide ever more encompassing accounts of islands. One line of work emphasized the notion that islands are associated with illicit extraction paths, such as constraints on extraction from non-complement categories (Huang 1982; Kayne 1983;

³ Some caution may be needed in determining whether a given language shows island effects for *wh*-in-situ, as the (un)acceptability of *wh*-in-situ may be affected by what it is compared to. If the language also allows *wh*-fronting and if that is used as a point of comparison, then the easier parsability of *wh*-in-situ constructions with islands may favor the conclusion that *wh*-in-situ escapes island effects. On the other hand, if a non-island *wh*-in-situ structure is used as the point of comparison, then this may encourage the conclusion that *wh*-in-situ obeys island effects. Thanks to Peter Cole for discussion of this issue.

Chomsky 1986). Another line of work emphasized the idea that extraction must not cross another similar element, as captured, for example, in Rizzi's *Relativized Minimality* constraint (Rizzi 1990). Other work combined the insights of these two general approaches (Manzini 1992; Chomsky 1995, 2001). The 1990s saw a rise in investigations of so-called *weak island* effects, with analyses based on syntactic (Rizzi 1990; Cinque 1991) or semantic constraints (Szabolcsi & Zwarts 1993). For useful reviews see Szabolcsi and den Dikken (1999) and Boeckx (2008).

Although islands still play an important role in syntactic discussions, it is probably safe to say that what was once a dominant topic is now less prominent. There continue to be many interesting new findings about the scope of island effects in different syntactic domains, but there have been few recent attempts to provide a unified account of island phenomena. To some extent this may be a consequence of the richness of the phenomena that have been discovered across languages.

2.3 *Alternatives to formal grammatical accounts*

Although the dominant thread of research on islands has analyzed them in formal grammatical terms, alternative accounts started to emerge almost as soon as island effects were discovered 40 years ago. This work has challenged the assumption that island effects are a syntactic phenomenon, and has instead argued that the effects are due to other components of language, or to independently motivated constraints on language processing resources.

This work is often strongly critical of formal grammatical accounts (not to mention exasperated, as advocates of the grammatical approach have typically ignored the alternatives). But it should be emphasized that the two traditions share a fundamental common goal. They share the assumption that the diversity and variability of island effects is unlikely to reflect an arbitrary set of superficial constraints, equal in number to the constructions that induce island effects. Both traditions pursue linguists' general aim of finding broad generalizations that allow simpler explanations of complex surface phenomena, and both traditions propose solutions that tend to be rather abstract. None of the competing approaches endorse the view that island effects are figments of linguists' imagination, and all assume that the effects help to reveal important generalizations about human language. I stress this point because there is a separate viewpoint that island effects are probably not real, and certainly not interesting, and hence probably irrelevant understanding human language. Skeptics about the existence or relevance of island effects sometimes assume common purpose with those who are skeptical of formal grammatical accounts, but they share little more than a common adversary. I think that it is fair to say that within linguistics there is almost no controversy about the importance of island effects or the need for general and abstract explanations for them.

Similarly, it is important to recognize that the various alternatives to formal syntactic accounts of island effects themselves differ in fundamental ways, and so they probably should not be treated as a natural class. Each alternative seeks to explain island effects in terms of independently motivated constraints, but the notion of independent explanation differs in each case. The independently motivated constraints may be linguistic or non-linguistic, and the explanations may be understood as eliminating the need for mentally

represented island constraints, or alternatively as accounts of how mentally represented island constraints arose in evolution.

2.3.1 *Reductionist accounts: Resource-based accounts*

The sentences that give rise to island effects are typically fairly complex, and speakers commonly judge that island violations are not merely unacceptable. They are also hard to understand. Unsurprisingly, there have been a number of attempts to reduce island effects to language comprehension difficulty, eliminating the need for formal grammatical constraints. Such accounts argue that island violating sentences are, in fact, grammatically well-formed, and that the perception of unacceptability reflects the conspiracy of two independently motivated effects that jointly overload a speaker's language processing resources. Long-distance extraction is associated with judgments of increased sentence complexity and comprehension difficulty (Gibson 1998; Hawkins 1999; Fiebach, Schlesewsky, & Friederici 2002; Phillips, Kazanina, & Abada 2005). The structural domains that induce island effects (relative clauses, *wh*-clauses, complex subjects) are also assumed to increase sentence complexity, although the evidence for this is better for some island types than others (see Sprouse, Wagers, & Phillips 2012; Sprouse this volume). Both structural phenomena are assumed to be grammatically licit but resource-hungry. When either of them occurs in isolation it is assumed that the demand for processing resources is sufficiently low for the sentences to remain under a putative threshold of acceptability. But when the two phenomena coincide they are claimed to overload the available resources, leading to the perception of unacceptability.

Accounts of this type have been proposed by Kluender and colleagues (Kluender & Kutas 1993; Kluender 1998, 2005, this volume), by Pritchett (1991), and recently by Hofmeister and Sag (2010). I refer to these proposals as *resource-based reductionist* accounts. They are 'reductionist' accounts because they argue that certain island effects can be captured without any need to encode explicit constraints in the mental grammar. Under these accounts island effects are truly epiphenomenal.⁴ The papers in this volume by Kluender, Sprouse, and Hofmeister and colleagues provide more detail on these accounts.

⁴ Advocates of these accounts sometimes object to the term 'reductionist'. Hofmeister and colleagues argue: "As we repeatedly assert here and in other publications, grammatical principles may have a hand in island effects. Our argument is not that all behavior tied to island effects reduces to general cognitive constraints, but that such constraints play a vital role" (Hofmeister, Staum Casasanto, & Sag, this volume). This caveat could mean a couple of different things. First, it could mean that resource-based accounts of island effects merely seek to account for a portion of the variance in island acceptability in terms of comprehension difficulty, leaving the main effects of islands for formal grammatical theories to explain. It is almost certain that the comprehensibility of island violations modulates ratings in acceptability studies, but it is clear that resource-based accounts are making a stronger claim than that. Second, it could be the claim that some islands are due to grammatical constraints, while most are epiphenomenal. For example, Sag notes that Head-driven Phrase Structure Grammar (Pollard & Sag 1994) offers an elegant account of the ban on extraction from coordinate structures, and he sees no need to replace this with a resource-based account. But the claim that certain island effects are grammatical in origin does not change the claim that other islands are artifacts of language processing. I therefore continue to use the term 'reductionist', because I think that it best captures the goals of the resource-based account for those island effects that it does seek to explain, whichever those might be.

2.2.3 *Reductionist accounts: semantic and pragmatic accounts*

A second class of accounts seeks to reduce island effects to independently motivated constraints, with no need to appeal to formal syntactic mechanisms, and they are sometimes grouped together with resource-based accounts of islands, but they qualify as ‘reductionist’ in a different sense. These are accounts that propose that an appropriate understanding of semantic and pragmatic constraints on language use is sufficient to explain some generalizations about islands. As such, they do seek to eliminate specifically syntactic island constraints, but they share with the formal accounts the assumption that island effects are due to linguistic constraints. The relevant constraints simply come from a different part of the grammar. These accounts typically seek to cover a specific subclass of islands, such as Complex NP islands and coordinate structures (Deane 1991), adjunct islands (Truswell 2007), *wh*-islands (Kroch 1989; Abrusan 2011), or factive, negative, and quantificational islands (Szabolcsi & Zwarts 1993; Abrusan 2011). Other accounts focus on the role of topic/focus or information structure constraints in inducing island effects (Erteschik-Shir 1973; Kuno 1976; Ambridge & Goldberg 2008).

This class of accounts makes a number of interesting observations. I do not address them here, as my main focus is on the feasibility of resource-based reductionist accounts of islands.

2.2.4 *Grounded accounts*

A fourth type of account of island effects is the *grounded grammatical* approach. Accounts of this type often make reference to constraints on language processing, and as such they are sometimes grouped together with resource-based reductionist accounts. But this superficial resemblance in terminology masks a deep difference between the two approaches. Grounded accounts are not reductionist accounts. Whereas a reductionist account claims that (at least some) island constraints simply do not exist, a grounded account seeks to offer an explanation of why island constraints exist. Such accounts often propose that island constraints are a useful feature of mental grammars, since they exclude a class of sentences that are hard to process (Fodor 1978, 1983; Berwick & Weinberg 1984; Hawkins 1999). Resource-based reductionist accounts make the synchronic claim that island constraints are not explicitly represented in a speaker’s mind. In contrast, grounded accounts offer a diachronic motivation for why island constraints should be explicitly represented in a speaker’s mind. In synchronic terms, the grounded accounts are identical to the formal grammatical accounts. As such, this class of accounts may be grouped together with other grammatical accounts for purposes of the current discussion.

3. Language Processing Phenomena that Fit Multiple Accounts of Islands

Before discussing some issues that I take to present genuine challenges for formal grammatical or reductionist accounts of island effects, it is useful to discuss some language processing phenomena that are sometimes mentioned in the context of this debate, but that I view as compatible with either approach.

3.1 Effects of islands on active dependency processing

Many experimental studies have tested whether islands impact on-line construction of long-distance dependencies (*filler-gap dependencies* in psycholinguistic parlance). With few exceptions these studies have concluded that islands clearly impact on-line processes. The studies are typically presented as testing the effects of grammatical island constraints, and as such they could be understood as arguments in favor of formal grammatical accounts, but this interpretation of the findings is unwarranted. The results are equally compatible with formal and reductionist accounts.

Experiments on the on-line impact of island effects have generally adopted one of two strategies. One line of work has focused on effects at the tail of a filler-gap dependency, and has tested whether effects of dependency formation are ‘switched off’ in island contexts. Another class of studies has focused on effects at the edges of island domains, and tested for evidence of disruption when filler-gap dependency processing is interrupted by an island.

As an example of the first type of test, Stowe (1986) demonstrated a measure of dependency formation known as the *Filled Gap Effect* (see also Crain & Fodor 1985). She compared reading times in sentences like (31a) that contain a *wh*-dependency and in closely matched sentences that lack a *wh*-dependency (31b), and found that reading times at the underlined pronoun were slower in the sentences with a *wh*-dependency. This slowdown is expected if readers first try to complete the *wh*-dependency as soon as they reach the verb *bring*, analyzing the *wh*-phrase as the direct object of the verb, and then get into difficulty upon encountering an overt pronoun in the direct object position. The true gap site turns out to be the object of a preposition later in the sentence. The filled gap effect is evidence for ‘active’ dependency processing, i.e., a mechanism that aims to complete a filler-gap dependency as soon as possible, without waiting for unambiguous evidence of the gap site (Frazier & Flores d’Arcais 1989).⁵

- 31 a. My brother wanted to know who Ruth will bring us home to ___ at Christmas.
b. My brother wanted to know if Ruth will bring us home to Mom at Christmas.

Armed with this measure of active dependency formation, Stowe then showed that filled gap effects were not observed inside islands. If readers attempted to complete the *wh*-dependency at the preposition *about* in (32a), which appears inside a subject island, then a filled gap effect should have been found at the underlined name that follows it, relative to the control condition (32b). No slowdown was observed. This suggests that active dependency formation does not occur inside subject islands. Further evidence of the disappearance of filled gap effects in island contexts has been found in English (Pickering, Barton, & Shillcock 1994; Aldwayan, Fiorentino, & Gabriele 2010), French (Bourdages 1992), and even in Japanese, where the filled gap effect occurs before any verbs have been encountered (Yoshida, Aoshima, & Phillips 2004).

⁵ If comprehenders actively seek to complete *wh*-dependencies at the first possible gap site, then we should also expect to encounter filled gap effects in subject positions. Stowe tested this prediction, but found no disruption in subject position. However, Lee (2004) did observe filled gap effects in subject position in an experiment that modified Stowe’s design.

- 32 a. The teacher asked what the silly story about Greg's older brother was supposed to mean ____.
- b. The teacher asked if the silly story about Greg's older brother was supposed to mean anything.

Similar evidence for the disappearance of active dependency formation effects in island environments comes from an alternative measure that relies on detection of semantic implausibility. The urge to complete a filler-gap dependency as soon as possible is strong enough that it can lead to formation of implausible verb-object relations. For example, Traxler and Pickering (1996) used eye-movement measures to compare the comprehension of sentences like (33a) and (33b). Both sentences are globally plausible, as it is equally plausible to write about a book and a city. But longer reading times were observed at the verb *wrote* in (33a) than in (33b), suggesting that readers initially constructed an implausible interpretation of the relativized NP *the city* as the direct object of *wrote*. A similar plausibility-based measure of active dependency formation has been observed using event-related brain potentials (ERPs: Garnsey, Tanenhaus, & Chapman 1989). Importantly, Traxler and Pickering found that the implausibility effects disappeared in island environments. By adding the relative pronoun *who* in (34) they created a relative clause island, which eliminated the implausibility effects at the verb. Similar evidence for the disappearance of plausibility effects inside islands has been reported in a number of other studies (Phillips 2006; Omaki & Schulz 2011; Omaki, Lau, Davidson White, & Phillips, submitted).

33 *Preamble: Waiting for a publishing contract.*

The big city was a fascinating subject for the new book.

- a. We like the city that the author wrote unceasingly and with great dedication about ____ while waiting for a contract.
- b. We like the book that the author wrote unceasingly and with great dedication about ____ while waiting for a contract.
- 34 a. We like the city that the author who wrote unceasingly and with great dedication saw ____ while waiting for a contract.
- b. We like the book that the author who wrote unceasingly and with great dedication saw ____ while waiting for a contract.

The results of studies that have looked for active dependency formation effects in island environments are almost unanimous: active dependency formation effects disappear in islands, suggesting that island constraints have an early impact on parsing.⁶ In most studies

⁶ Two studies do not fit with this consensus. Clifton and Frazier (1989) used a speeded acceptability judgment paradigm to test sentences with a grammatical *wh*-dependency that was interrupted by a relative clause. The relative clause contained either an obligatorily intransitive verb (e.g., *excelled*) or an optionally transitive verb (e.g., *won*), e.g., *What did John think the girl who always {excelled/won} received?* Judgment responses were slower in the condition with the optionally transitive verb. Clifton and Frazier interpreted the slowdown as evidence that participants considered an island-violating dependency with *what* as the object of *won*. But the slowdown could also have simply reflected uncertainty over the argument structure of *won*. Pickering and

the evidence for the impact of island constraints relies on null effects, but this is not true of all studies. Wagers and Phillips (2009) used a plausibility manipulation paradigm to test for the effects of the Coordinate Structure Constraint (CSC), which requires that if any conjunct in a coordinate structure contains a gap then all conjuncts must contain a gap. They found that implausibility effects persisted to the second verb in a coordinate structure (35a), but that such effects were absent at the second verb in a closely matched adjunct clause (35b), which is not subject to the CSC. They took this as evidence that active dependency completion normally terminates as soon as a suitable gap site is found, but that the CSC forces the process to continue in coordinate structures.

- 35 a. The {wines|cheeses} which the gourmets were energetically discussing ___ or slowly sipping ___ during the banquet were rare imports from Italy.
b. The {wines|cheeses} which the gourmets were energetically discussing ___ before slowly sipping {the samples|some wine} during the banquet were rare imports from Italy.

A second class of studies has tested the on-line effects of islands by focusing on processing disruption that occurs when filler-gap dependency processing is interrupted by encountering the boundary of an island. For example, in an ERP study by McKinnon and Osterhout (1996) scalp voltages were compared at the embedded *wh*-word *when* in sentences where it interrupted a *wh*-dependency (36a, island condition) and sentences where it did not (36b, control). In the island condition the word *when* it elicited a P600 effect, a component typically associated with syntactic anomalies or syntactic processing difficulty. The authors took this as evidence that island constraints apply at the earliest stages of sentence comprehension. Similar effects at island boundaries have been obtained in other ERP studies (Neville, Nicol, Barss, Forster, & Garrett 1991; Kluender & Kutas 1993), and detection of an island boundary may be responsible for the very fast detection of island violations in a speed-accuracy tradeoff (SAT) study by McElree and Griffith (1998).

- 36 a. I wonder which of his staff members the candidate was annoyed when his son was questioned by ___.
b. I wonder whether the candidate was annoyed when his son was questioned by his staff member.

It is certainly interesting to find that so many of the island effects that we can observe in off-line judgments also impact the on-line search for gap sites. But this correlation between off-line and on-line island effects does not help to decide between competing accounts of the cause of island effects. Formal grammatical accounts can straightforwardly capture the correlation by assuming that island constraints are deployed quickly and effectively by the

colleagues (1994) used a filled-gap paradigm to test for effects of active gap creation inside relative clauses. In self-paced reading and eye-tracking studies they found a slowdown at the relative clause verb, rather than at the the subsequent filled gap. They suggest that the slowdown at the verb might reflect illicit *wh*-dependency formation, but conceded that it could simply reflect the overall processing load of the sentence at that point.

parser. Meanwhile, resource-based reductionist accounts can equally well explain the correlation, by claiming that the same resource limitations that are responsible for island effects in acceptability judgments constrain on-line dependency formation. In fact, the link between off-line and on-line effects may be more directly predicted by the reductionist account, given the general reluctance of formal syntactic theories to make predictions about real-time phenomena (Chomsky 1965 and many others).

3.2 *Forced construction of island-violating dependencies*

Most of the studies reviewed in Section 3.1 focused on subject islands, sometimes also including relative clauses. The focus on subject islands is no accident, and it serves to highlight an important distinction between two questions that we can ask about the processing of islands (37).

- 37 a. Does the parser construct island-violating dependencies when it is not forced to do so?
- b. How easily does the parser construct island-violating dependencies, when it is forced to do so?

The studies on islands and active dependency formation have focused on question (37a). In examining active dependency formation these studies seek to understand where the parser is inclined to posit a gap site, before the bottom-up input tells it where the gap should be. Therefore, in order to test whether active dependency formation considers island-violating gaps among its options, it is important to create contexts where the parser has at least one legitimate gap site available at the point when it is processing the island. Subject islands are well suited for this, as they present the parser with a choice between completing a filler-gap dependency as soon as possible by creating a gap site inside the subject island, or of waiting to create the gap site in main clause object position, as shown in the examples in (32) and (34). The consistent finding that the parser fails to actively create gaps inside islands does not show whether speakers are capable of representing island-violating dependencies, and it does not address question (37b). What it shows is that the parser does not create gaps inside islands when it is not forced to do so (but see Section 4.2 for an important exception).

In contrast, some studies on the processing of islands have focused on question (37b), asking whether island-violating dependencies are constructible on-line, and if so what makes them easier or harder. The findings from these studies are interesting, but they also do not bear on the choice between grammatical and reductionist accounts of islands.

Freedman and Forster (1985) asked whether island-violating sentences are representable, using a sentence-matching paradigm. They relied on previous findings that same-different judgments for pairs of simultaneously presented items are faster when the items are well formed linguistic units. For example, the identity of the letter strings in (38a) is recognized faster than the letter strings in (38b), because the first pair forms a word (Chambers & Forster 1975). Similar contrasts are found when matching coherent sentences vs. random word strings (Forster 1979).

38 a. HOUSE
HOUSE

b. HSEUO
HSEUO

Freedman and Forster reasoned that if island-violating sentences are representable, then they should show a similar benefit in a sentence-matching task, and their results support this prediction, based on extractions from definite NPs, as in (39). They used these findings to motivate a stronger theoretical conclusion, arguing that they support syntactic theories like *Government-Binding Theory* (Chomsky 1981) that distinguish two types of ungrammatical sentences: those that simply cannot be generated, and those that are generable but run afoul of some grammatical constraint. They contrasted this with theories like *Generalized Phrase Structure Grammar* (Gazdar, Klein, Pullum, & Sag 1985) that did not make such a distinction. This interesting argument was the subject of a heated subsequent debate (Crain & Fodor 1987; Forster & Stevenson 1987; Stowe 1992; Stevenson 1999), which had the effect of consigning the sentence matching paradigm to the list of tasks that few psycholinguists are willing to touch.

- 39 a. Who did the duchess sell Turner's portrait of?
b. Who did the police believe the claim that John shot?

In more recent work, Hofmeister and Sag (2010) measured reading times and acceptability judgments in sentences with Complex NP islands and *wh*-islands like (40), and found that replacing a bare *wh*-phrase (*who*) with a specific *wh*-phrase (e.g., *which convict*) both improved acceptability ratings and facilitated reading times, particularly around the most deeply embedded verb. They argued that these correlations support the view that (i) the island violations in (40) are grammatical, and (ii) their (mild) unacceptability is a consequence of constraints on language processing.

- 40 a. I saw {who | which convict} Emma doubted the report that we had captured __ in the nationwide FBI manhunt.
b. {Who | Which employee} did they learn whether Albert dismissed __ after the annual performance review?

In light of the reasoning used in Section 3.1, the finding that reading times and acceptability judgments are affected by the same manipulation does not favor either grammatical or reductionist accounts of islands. The sentences tested in these studies leave the parser with no option but to form a *wh*-dependency into a (mild) island. This suggests that those dependencies are indeed representable. But representability and well-formedness are independent notions, as emphasized by grammatical theories such as Optimality Theory (Prince & Smolensky 1993; Smolensky & Legendre 2006) and Government-Binding Theory (Chomsky 1981). Meanwhile, the correlation between acceptability and reading times argues in favor of a reductionist account of islands roughly as strongly as the disappearance of active dependency formation effects in islands favors a grammatical account of islands, i.e., not at all.

Hofmeister and Sag admit that the correlation between acceptability judgments and reading times is, in principle, compatible with grammatical and reductionist accounts. But they argue that the reductionist account should be preferred, since it is based on

independently-motivated mechanisms whose effects on reading times and acceptability are also seen in clearly grammatical sentences. But this argument does not work, because it misses the basic phenomenon that theories of islands should explain. It is relatively uncontroversial that long-distance filler-gap dependencies affect comprehension difficulty and acceptability in island and non-island contexts alike. The phenomenon to be explained is specifically that long-distance filler-gap dependencies have a much stronger impact in island contexts than they do in non-island contexts (see Sprouse (this volume) for further discussion). Hence, merely showing that some factor has a measurable effect on island and non-island sentences has little bearing on the nature of island effects.

3.3 *Satiation*

Studies on so-called *syntactic satiation* effects have sometimes been offered as evidence on the cause of island effects. Linguists often report that after working on some phenomenon for an extended period of time their familiarity with the relevant sentences starts to cloud acceptability differences that had previously been clear to them. “I no longer trust my judgments on these sentences” is a common complaint. Satiation studies are attempts to recreate these anecdotal effects in a relatively short period of time in the lab. Participants’ acceptability judgments are monitored across a number of different presentations of an unacceptable construction, and experimenters test whether acceptability ratings increase with repeated exposure. It is far from obvious that the anecdotal effects should appear in the lab, since the 5-15 presentations typically used in satiation experiments with naïve participants are likely a small fraction of the self-conscious judgments by a professional linguist that causes the effect to occur in the wild. Nor is it obvious that effects obtained in the lab should be seen as comparable to the anecdotal reports. Nevertheless, a number of interesting findings about satiation effects have been reported, particularly in the domain of islands (Snyder 2000; Hiramatsu 2000; Sprouse 2009; Francom 2009; Goodall 2011; Crawford 2011).

For current purposes the most relevant aspect of these studies is the claim that satiation provides evidence on whether unacceptable sentences are ill-formed or merely difficult. Specifically, Snyder (2000) reported that some types of island showed satiation effects but others did not, and proposed that satiation may be diagnostic of constructions that are grammatical-but-difficult, whereas resistance to satiation may be an indication that an island is grammatical in origin. If Snyder’s proposal is correct, then satiation could be a valuable tool for diagnosing the source of unacceptability in a wide variety of sentence types. Accordingly, a number of studies have attempted to replicate and extend Snyder’s original finding.

Unfortunately, the results of the many studies that have been conducted on satiation effects and islands are rather mixed. There are a number of reports of satiation in *whether*-islands, and no reports of satiation in adjunct islands.⁷ But other island types have shown satiation effects in some studies and not in others (Complex NP Constraint, Subject islands, Complementizer-trace islands). And in perhaps the most extensive series of satiation studies to-date, Sprouse consistently failed to find satiation effects in all of these island

⁷ At least, not in English, to my knowledge. Myers (2006) reports a satiation effect in adjunct islands in Chinese.

types, despite using a wide range of different measures and using more repetitions of the critical structures (10-14 repetitions per island type) than most other studies (Sprouse 2009).⁸ It remains unclear at present why the results of these studies are so varied.

Even setting aside the empirical uncertainty of satiation effects, the inference from satiation to well-formedness deserves closer scrutiny. This inference appears to be motivated by a couple of related assumptions. The first assumption is that well-formed-but-difficult sentences should show higher acceptability ratings following repeated presentations. The second assumption is that satiation is a type of syntactic priming effect, and that a structure is primable only if it is representable (cf. Kaschak & Glenberg 2004; Luka & Barsalou 2005). Shifts in acceptability ratings for island-violating sentences are therefore taken to indicate that those constructions are representable and syntactically well-formed. There is, of course, a flaw in this argument. Primability probably does entail representability, but as already discussed above, representability does not entail well-formedness, as emphasized in a number of leading grammatical theories. Also, the fact that well-formed-but-difficult sentences show satiation effects does not mean that satiation effects entail well-formedness. That argument would only go through if ill-formed sentences never show satiation, and this seems to be incorrect.

Relatively few simple acceptability rating studies have tested for satiation of clearly ungrammatical sentences, but there is ample evidence of related effects in ERP studies. These studies are informative for a couple of reasons. ERP measures distinguish the brain responses to different types of linguistic anomaly, and consequently there have been many ERP studies of syntactic violations. In addition, the sensitivity of ERPs is accompanied by a relatively poor signal-to-noise ratio, which requires that experiments be rather long, typically including 30 or more repetitions of each condition per person, spread over test sessions lasting as long as 2-3 hours. In many instances ERP researchers seek to reduce the length of their studies by using relatively high ratios of target to filler items in their studies. This means that ERP studies may inadvertently provide more evidence on satiation effects than do the studies that were specifically designed to test satiation. One finding from these studies is that the ERP response to a syntactic anomaly tends to get smaller over the course of a study. Most studies report only the grand average ERP response to all items in a study, but when results from the first and second half of a study are compared, they show smaller effects in the second half of the study (e.g., Gouvea, Phillips, Kazanina, & Poeppel 2010). In one set of studies that used very high ratios of ungrammatical to grammatical sentences it was found that the P600 response component normally associated with ungrammatical sentences was instead observed in the grammatical sentences (Coulson, King, & Kutas 1998; Hahne & Friderici 1999). The ERP results do not directly show that the acceptability of unambiguously ungrammatical sentences increases with repeated presentation, but they do show that the processing of those sentences shows clear satiation.

In summary, syntactic satiation effects for islands are potentially interesting, but it remains unclear whether the effects are stable in a lab setting. This is perhaps not surprising, given the small number of exposures used in most experiments on the topic. Also, even if the findings were clear, it is not straightforward to draw inferences from

⁸ It is worth noting that Sprouse did not set out with the goal of disconfirming satiation effects. His initial goal was to build upon Snyder's finding, and his many attempts at replicating the satiation effect were driven by a desire to identify how to robustly elicit satiation effects.

satiability to grammaticality (for related discussion, see Hofmeister, Staum Casasanto, & Sag, this volume).

4. Challenges for a Reductionist Account

The previous section established that the representability of island-violating dependencies and the finding of on-line effects of islands are both informative, but not about the choice between grammatical and reductionist accounts of island effects. In this section and the next I turn to some phenomena that are more challenging for one or the other approach.

4.1 *Island structures that are not difficult*

All accounts of island effects must reconcile the unacceptability of island violations with the acceptability of *wh*-dependencies when no islands are involved, and the acceptability of island structures when no *wh*-dependencies are involved. Formal grammatical accounts do this by positing specific constraints that target the combination of island structures and *wh*-dependencies. Resource-based reductionist accounts instead claim that unacceptability arises because island structures and *wh*-dependencies are individually difficult, though not difficult enough to cause unacceptability. But when the two sources of difficulty are simultaneously present their effects combine in a super-additive fashion, yielding sharply increased difficulty and clearly reduced acceptability (for more detailed discussion see Sprouse, this volume; Sprouse et al. 2012).

A key premise of the reductionist account, therefore, is that island structures and *wh*-dependencies are both independently difficult. There is good evidence that *wh*-dependencies increase the difficulty of a sentence. Sentences with *wh*-dependencies are rated as harder and less acceptable than sentences without *wh*-dependencies, and sentences with longer *wh*-dependencies are rated as harder and less acceptable than sentences with shorter *wh*-dependencies (Gibson 1998; Phillips et al. 2005; Sprouse et al. 2012; Wagers this volume). ERP measures of *wh*-dependency construction vary as a function of dependency length (Fiebach, Schlesewsky, & Friederici 2002; King & Kutas 1995; Phillips et al. 2005). And sensitivity to the semantic content of filler phrases is reduced in sentences with longer *wh*-dependencies (McElree, Foraker, & Dyer 2003; Wagers & Phillips submitted). However, there have been relatively few tests of the independent difficulty associated with island structures, and the available evidence indicates that they do not consistently incur a processing cost. For example, Sprouse and colleagues measured the acceptability of four types of island structures using rating scales and magnitude estimation (Sprouse et al. 2012). They found that one type of island structure had a consistent impact on acceptability ratings independent of *wh*-dependencies (*whether*-islands), but the other three types of island structures did not (Complex NP islands, Subject islands, Adjunct islands). The effect of these island structures on ratings was either non-existent, or inconsistent, or too small to plausibly cause dramatic processing difficulty when combined with a *wh*-dependency.

The finding that island structures are not consistently difficult undermines a key component of reductionist accounts.

4.2 Active filling is possible inside islands (when the grammar allows it)

Resource-based reductionist accounts of islands claim that active *wh*-dependency formation fails to occur in island environments simply because of the processing difficulty that it would incur. Grammatical accounts of islands claim that it fails to occur in island environments because of a grammatical constraint. These accounts make overlapping predictions in most cases, as pointed out in Section 3.1 above. But the accounts make divergent predictions in the case of parasitic gap constructions.

Parasitic gap constructions are multiple gap constructions that allow a gap inside an island to be acceptable, due to the presence of an additional gap that is outside the island, as described in Section 2.1.4 and illustrated in (41-42) (Engdahl 1983; Culicover & Postal 2001). (41a) illustrates the familiar ban on extraction from subjects, but when the illicit gap in (41a) is combined with the fully acceptable direct object gap in (41b) the result is also acceptable (41c). (42) shows that not all subject island violations can be rescued in this way. The complex subject in (42) contains a finite relative clause instead of the infinitival complement clause in (41), and in this case the combination of the island violating gap (42a) and the good gap (42b) is still unacceptable (42c).

- 41 a. *What did [the attempt to repair ___] ultimately damage the car?
d. What did [the attempt to repair the car] ultimately damage ___?
e. What did [the attempt to repair ___] ultimately damage ___?
- 42 a. *What did [the reporter that criticized ___] eventually praise the war?
b. What did [the reporter that criticized the war] eventually praise ___?
c. *What did [the reporter that criticized ___] eventually praise ___?

Under a grammatical account of islands the parser can, in principle, take advantage of these detailed properties of the grammar in deciding where to actively posit gap sites. Phillips (2006) showed that the parser's actions are indeed closely guided by the grammar of parasitic gaps. In a self-paced reading study that manipulated plausibility as a probe for active dependency formation he found that comprehenders were sensitive to the plausibility manipulation in the infinitival-subject conditions. *Schools* can be expanded, but *students* cannot, and this led to reading time differences at the underlined verb *expand* in (43a). But the same plausibility manipulation yielded no reading time slowdowns in the finite-subject conditions (43b). These differences indicate that active dependency formation into subject islands is, in fact, possible, but only in contexts where a parasitic gap is licensed. These effect obtained despite the fact that participants never encountered a parasitic gap construction in the study. They encountered constructions that could have turned out to be parasitic gap constructions, but this possibility was never realized.

- 43 a. The school superintendent learned which {schools|students} the proposal to expand drastically and innovatively upon the current curriculum would {overburden|motivate} during the following semester.
b. The school superintendent learned which {schools|students} the proposal that expanded drastically and innovatively upon the current curriculum would {overburden|motivate} during the following semester.

These findings are unexpected under a reductionist account of subject islands. If subject island violations like (41a) are unacceptable because it is too difficult to create a gap inside a complex subject, then this difficulty should be evident regardless of whether the gap is licensed by a subsequent well-formed gap.⁹

As such, the findings about parasitic gaps undermine the prediction of reductionist accounts that island-violating dependencies are avoided because they are too difficult.

4.3 *No correlation between working memory resources and island effects*

Resource-based reductionist accounts of islands claim that island effects are a simply a consequence of resource-hungry syntactic operations that combine (super-additively) to yield a perception of unacceptability. The super-additive effect of combining island structures and *wh*-dependencies is well documented, and it is assumed to be a consequence of the limited pool of language processing resources that individuals have at their disposal. Consequently, this predicts that individual variation in working memory resources should be associated with individual differences in the strength of island effects. This prediction appears to be false.

In a recent study we gathered two types of acceptability measures (rating scales and magnitude estimation) on four types of island effects, and took two different measures of working memory resource capacity (*n*-back, serial recall tasks) in around 300 individuals (Sprouse et al. 2012). We tested for correlations between individual measures of the strength of island effects and individual memory capacity scores, and found that the resource capacity scores accounted for only 0% - 3% of the variation in island effect scores. This lack of correlation does not support the resource-based reductionist approach to islands. For a fuller discussion of these findings see Sprouse (this volume).

It is important to note that the measure of the strength of island effects used in this study was not based simply on ratings from island-violating sentences. Rather, the strength of an island effect was defined in terms that are more directly related to predictions of the resource-based reductionist account. It is reasonable to assume that syntactic phenomena such as *wh*-dependencies and island structures should contribute a measurable cost to the difficulty of processing a sentence, irrespective of the resources available to the processor. In a processor with unlimited resources, the costs of these syntactic phenomena should combine in a linear fashion, so that the cost of processing a sentence with both a *wh*-dependency and an island structure (i.e., an island violation) should be predictable

⁹ Hofmeister et al. (this volume) argue that this criticism of reductionist accounts is misplaced, since according to their approach “dependency formation inside islands is difficult, not impossible or prohibited”. They also take me to task for supposedly using both the presence and absence of active dependency formation effects in islands to argue against their approach. This is inaccurate. The absence of active dependency formation effects in regular island contexts does not arbitrate between grammatical and reductionist accounts of islands, as I emphasize in Section 3.1. On this point I agree with Hofmeister and colleagues. But the reductionist account therefore does predict that active dependency formation effects should be absent in non-finite subject islands. If a subject island violation like **Which school did [the proposal to expand _] overburden the students?* Is unacceptable due to difficulty of completing the *wh*-dependency, then we should not expect to see active gap-creation effects in exactly those contexts. On the other hand, if difficulty does not entail the absence of active gap-creation effects, then we should expect to see active gap-creation effects in other types of islands, contrary to fact.

from the sum of the individual costs. But in a processor with limited resources the cost of the individual phenomena may combine super-additively, i.e., the cost of processing an island violation may be greater than the combined cost of processing a *wh*-dependency and an island structure. In a resource-based account, this is what underlies island effects. Moreover, the degree to which the combined cost exceeds the sum of the individual costs should increase in individuals who have fewer available resources. Therefore, a resource-based account of island effects predicts that individuals with higher working memory scores should exhibit smaller island effects.

The size of island effects can be operationalized based on ratings on four sentence types, which independently manipulate the presence or absence of island structures and of long-distance *wh*-dependencies. This is illustrated in (44), which shows the mean normalized ratings for the test of *whether*-islands in Experiment 1 of Sprouse et al. (2012). Based on these mean ratings the independent cost of a long-distance *wh*-dependency can be estimated as the difference between 0.87 and 0.22, i.e., 0.65, and the independent cost of the island structure can be estimated as the difference between 0.87 and 0.47, i.e., 0.40. Hence the sum of these two costs predicts a rating of -0.18 for the island violation in (44d). The observed rating for the island structure is much lower, at -0.91 , and hence the size of the super-additive effect is 0.73. The size of this effect is also known as the difference-between-differences or *DD score*. It is the *DD score* that showed no correlation with measures of working memory capacity.

44 a.	Who ___ thinks that John bought a car?	- island / - long-distance	0.87
b.	What do you think that John bought ___?	- island / + long-distance	0.22
c.	Who ___ wonders whether John bought a car?	+ island / - long-distance	0.47
d.	What do you wonder whether John bought ___?	+ island / + long-distance	-0.91

A possible concern about the lack of correlation between working memory measures and the strength of island effects is that perhaps we simply tested working memory measures that tap into different components of memory capacity than are taxed by processing island violations. We think that there is good evidence that this is unlikely.

Most importantly, if there really is a relation between island effects and an independently motivated measure of working memory capacity, but we simply chose the wrong measures, then the following conditions must be met: (i) there is some other measure of working memory capacity that does correlate with island effects; but (ii) that measure does not correlate with either of the measures that we used (serial recall, *n*-back). At present we know of no such measure. Research on individual differences suggests that there are two primary underlying constructs that current working memory capacity measures tap into, and that the *n*-back task taps into one of these, and serial recall tasks and complex memory span tasks such as the reading span task tap into the other. As evidence for this, individual differences in serial recall and complex span tasks are strongly correlated with one another, but not with *n*-back scores (Roberts & Gibson 2002; Conway, Kane, Bunting, et al. 2005; Kane, Conway, Miura, & Colflesh 2007).

In addition, in a recent study Michel (2011) extended our findings by testing for correlations between island effects and further working memory measures, including verbal span (Daneman & Carpenter 1980), memory interference, and a flanker task (Eriksen & Schulz 1979). Michel was particularly interested in the possibility that island

effects might correlate with memory tasks that involve interference, which plays a prominent role in some recent theories of sentence processing (e.g., Lewis, Vasishth, & Van Dyke 2006). In a test with 81 participants He found no correlation between island effects and any of his memory capacity measures. Tokimoto (2009) found a similar non-correlation between island effects and a reading span task in Japanese. By adding to the list of memory tasks that show no correlation with island effects, Michel's findings make it even more unlikely that there is an independently motivated memory measure that predicts island effects.¹⁰

4.4 *Island structures do not block other types of active dependency formation*

One of the attractions of a reductionist account of island effects is that it seeks to derive the properties of island violations without invoking specific constraints on islands. If it could be shown that linguistic phenomena that are processed in a similar fashion to *wh*-dependencies are impacted by island structures in the same fashion as *wh*-dependencies are, then this could lend support to the reductionist account. This has been tested in a recent study by Yoshida and colleagues (Yoshida, Kazanina, Pablos, & Sturt 2011), and the results provide no support for the reductionist account.

Yoshida and colleagues tested the effects of an island-inducing structure on cataphoric dependencies, which are independently known to engage active dependency formation mechanisms. Cataphoric dependencies involve pronouns that are dependent on subsequent noun phrases for their interpretation, as in (45). Previous studies using eye-tracking and self-paced reading methods showed that comprehenders actively search for an antecedent of a cataphoric pronoun (van Gompel & Liversedge 2003; Kazanina, Lau, Lieberman, Yoshida, & Phillips 2007; Aoshima, Yoshida, & Phillips 2009; Kazanina & Phillips 2010). Evidence for this comes from gender mismatch effects found in sentences like (46a-b). Both (46a) and (46b) are fully acceptable sentences, and in both cases the pronoun has an intra-sentential antecedent. But van Gompel and Liversedge found that reading times following the main clause subject *the boy* were slower in (46b), where it mismatched the gender of the preceding pronoun. This suggests that readers expected to encounter an antecedent for the pronoun in that position, and formed a cataphoric dependency between the pronoun and the subject before processing the semantic features of the subject. This is similar to the plausibility mismatch effects found in *wh*-dependency

¹⁰ Hofmeister et al. (this volume) argue that the non-correlations between working memory capacity and island effects are uninformative, for two reasons. First, they suggest that we may have simply chosen the wrong memory measures in our study. As pointed out above, this skeptical stance is insufficient: we do not know of an independently motivated working memory measure that fails to correlate with any of the measures tested by Sprouse et al. (2012) and Michel (2011). Second, they point to an example in their own work of a correlation between working memory capacity and *wh*-dependency length, but note that the correlation is not evident when one looks only at the data from individual difficult conditions. Instead, the effects are visible when comparing easier and harder conditions. Also, they find (as do we) that high-span individuals show larger dependency length effects than low-span individuals. This counter-intuitive effect reflects the fact that high-span individuals give higher ratings to easier sentences. Hence, they argue, "WM estimates and processing difficulty are not straightforwardly related in acceptability judgments." But our analyses were sufficiently flexible that they would allow us to detect various different correlations between island effects and memory capacity, not only the one predicted by the reductionist account, and Michel (2011) carried out additional analyses that we did not carry out, and again he found no correlations.

processing, and suggests that cataphoric pronouns trigger active dependency formation, presumably engaging working memory mechanisms in a very similar fashion.

45 a. Her mother thinks that Sally is a fine basketball player.

- 46 a. When he was fed up, the boy visited the girl very often.
b. When she was fed up, the boy visited the girl very often.

Yoshida and colleagues reasoned that if island effects reflect consequences of capacity limitations on active dependency formation mechanisms, then island structures should block active cataphoric dependency processing in the same way that they block active *wh*-dependency processing. They therefore tested whether gender mismatch effects are found in cataphoric dependencies that span relative clause boundaries, or whether they are blocked by the island structure, using materials like (47). In (47a) the NP *Jeffrey Stewart* is syntactically and semantically suitable as an antecedent for the sentence-initial pronoun *his*, despite the fact that it is embedded inside a relative clause. (47b) is identical, except for the change in the gender of the initial pronoun, and so active dependency formation should yield a gender mismatch effect in this condition. (47c-d) were included as syntactic controls. In these conditions the sentence-initial pronoun is the main clause subject, and therefore it c-commands the NP *Jeffrey Stewart*. This should prevent coreference, due to Binding Condition C, which prevents a pronoun from c-commanding its antecedent (Chomsky 1981). This constraint had previously been shown to block active processing of cataphoric dependencies (Kazanina et al. 2007; Kazanina & Phillips 2010), and so no gender mismatch effect is expected in (47c-d). Yoshida and colleagues found that the second word of the noun phrase *Jeffrey Stewart* was read more slowly in (47b) than the other three conditions, indicating that active formation of cataphoric dependencies is unaffected by relative clause structures. They argue that this casts doubt upon reductionist accounts of island effects.

- 47 a. His managers revealed that the studio that notified Jeffrey Stewart about the new film selected a novel for the script, but Annie did not seem to be interested in this information.
b. Her managers revealed that the studio that notified Jeffrey Stewart about the new film selected a novel for the script, but Annie did not seem to be interested in this information.
c. He revealed that the studio that notified Jeffrey Stewart about the new film selected a novel for the script, but Andy did not know which one.
d. She revealed that the studio that notified Jeffrey Stewart about the new film selected a novel for the script, but Annie did not know which one.

One could, of course, defend a reductionist account of island effects by supposing that island-inducing structures lead to capacity overload only when they co-occur with active *wh*-dependency processing, but not when they co-occur with active cataphoric dependency processing. It is certainly possible that the two types of active dependency formation tax the language processor in different ways. But such an account remains to be articulated, and it runs the risk of turning into a notational variant of the formal grammatical account.

4.5 Two types of cross-language variation in island effects

It would be attractive from a learning perspective if island effects showed no variation across languages, but there is growing evidence that island effects do indeed show cross-linguistic variation. Some examples were summarized above in Section 2.1.5. This includes variation in subject island effects (Stepanov 2007), adjunct island effects (Yoshida 2006), specific subclasses of relative clause islands (Engdahl 1982; Han & Kim 2004; Hsu 2006; Ishizuka 2009), and complementizer-trace effects (Rizzi 1982; Roberts & Holmberg 2010). Cross-language variation in island effects can arise in at least two different ways, each of which presents distinct challenges for reductionist accounts of islands.

First, a pair of languages may show different island effects in closely matched structures. In this scenario the island effects differ because the island constraints differ, i.e., *deep variation* in island effects. For example, extraction from clausal subjects is generally disallowed in English and many other languages, but it appears to be possible in Russian, Hungarian, Palauan and other languages (see (29) above; Kiss 1987; Georgopoulos 1991; Stepanov 2007).¹¹ This scenario can be accommodated more easily in grammatical approaches to islands. Languages clearly vary along many grammatical dimensions, and so it is straightforward to add variation in island constraints as another way in which grammars vary, although it is not particularly welcome from a learning perspective. However, this kind of cross-language variation is less straightforwardly accommodated in a resource-based reductionist account of islands. If the island structures are closely matched in the two languages, and if *wh*-dependency processing draws on the same independently-motivated memory mechanisms in all languages, then a reductionist account should predict no difference in island effects between languages with similar surface structures.

Alternatively languages may show different island effects without differences in island constraints. This second type of cross-language variation can arise when languages have superficially similar sentences that reflect different structural representations. The implications of this *surface variation* for reductionist accounts of islands are different.

For example, English and Italian differ in the acceptability of complementizer-trace effects (48a-b). A classic account of this contrast attributes the difference to the availability of post-verbal subjects in Italian (48c). If Italian sentences like (48b) involve extraction from the post-verbal position, rather than from the canonical subject position, then the ban on extraction from post-complementizer position can be avoided, despite a surface word order that is identical to the English counterpart. The syntax literature contains some striking evidence for this link between complementizer-trace effects and post-verbal subjects (Brandi & Cordin 1989; Kenstowicz 1989).¹²

¹¹ One could, of course, argue that these cases of acceptable extraction from subjects are only apparent, and that they in fact should be analyzed differently. Stepanov (2007) considers and rejects one such possibility, namely that licit extractions from complex subjects might involve a null resumptive pronoun. Stepanov argues that if the languages in question used this strategy to allow extraction from subjects, then a similar strategy should make extraction from adjuncts possible, too. Since these languages do not allow extraction from adjuncts, Stepanov argues that the extractions from subjects must involve true *wh*-dependencies, and hence that the islandhood of subjects should be parameterized.

¹² Claims about cross-language clustering of post-verbal subjects, complementizer-trace phenomena, and other properties of null subject languages have been controversial (Gilligan 1987; Newmeyer 2004; Roberts

48 a. *Who did you say that _ wrote this book?

c. Chi_i hai detto che ha scritto questo libro __i?
 who have.2sg said that has written this book

c. Hanno telefonato molti studenti.
 have.3pl called many students

Similarly, the cases of apparently extractable relative clauses in East Asian languages appear to involve so-called *major subject constructions* in those languages (Sakai 1994; Han & Kim 2004; Hoshi 2004; Hsu 2006; Ishizuka 2009). Major subject constructions allow a noun phrase that sits outside of a relative clause to license a null subject that sits inside the relative clause, as shown by the Japanese example in (49a). When the RC-external noun phrase is extracted, it yields a surface word order that closely resembles an illicit extraction from an RC, but this is misleading. The true gap site is outside the RC, and so avoids the ban on extraction from RCs, and it is related to the null subject position inside the RC by a variety of antecedent-pronoun relation (49b). Evidence for this analysis comes from demonstrations that constraints on major subject constructions also restrict apparent extractions from relative clauses. Thus, these languages do not show variation in the islandhood of relative clauses. Rather, they have an additional structural option that creates the illusion of acceptable extraction from relative clauses.

49 a. [_{IP} sono sinsi_i-ga [_{NP} [_{CP} pro_i __j kiteiru] [_{yoohuku_j}]]-ga yogoreteiru]
 that gentleman-NOM pro wearing-is suit-NOM dirty-is
 'That gentleman is such that the suit that he is wearing is dirty.'

b. [_{CP} Op_i [_{IP} __i [_{NP} [_{CP} pro_i __j kiteiru] yoohuku_j]-ga yogoreteiru] [sinsi_i]]
 Op pro wearing-is suit-NOM dirty-is gentleman
 'The gentleman who the suit that he is wearing is dirty.'

This second type of cross-linguistic variation in island effects is straightforwardly accommodated in formal grammatical accounts of islands. In fact, it is a rather attractive option, as it reduces the burden on the learner by preserving the uniformity of island constraints, and it links hard-to-observe properties of island phenomena to easier-to-observe properties of independently motivated constructions in the relevant languages.

It is less clear how this kind of variation in island effects fits with reductionist accounts of islands. Reductionist accounts tend to avoid appealing to intricate structural details, and in particular shy away from notions like phonologically empty categories, preferring accounts that can be stated in terms of relations between overt words and phrases in the sentence. One might conclude from this that the structural differences that formal theories

& Holmberg 2010). Although early claims of strict clustering of null subject language properties (Rizzi 1982) appear to have been optimistic, current evidence suggests that languages can avoid complementizer-trace effects for multiple reasons, but that the one-way implication from post-verbal subjects to the absence of complementizer-trace effects is reliable (cf. Roberts & Holmberg 2010; Lohndal 2009).

appeal to in order to explain cross-linguistic variation in island effects should be off-limits to reductionist accounts. But this is probably unfair. The claim that island effects are epiphenomena of language processing demands on the one hand, and the general squeamishness about empty categories and related notions on the other hand, are independent of one another, and so there should be no reason why a reductionist account of cross-language variation could not appeal to post-verbal subject positions in Italian or to major subject constructions in Japanese/Chinese/Korean, just as in formal grammatical accounts. However, if a reductionist account were to follow this path – I am speculating here, as this goes well beyond what any existing reductionist theory has claimed – then this would beg the question of why it is that those structural differences should circumvent island effects. For example, in a formal grammatical account of escapable relative clauses in Japanese, it is straightforward to say that there is a filler-gap dependency between the extracted phrase and the major subject position that is licit because it does not span a relative clause boundary, and that there is an additional antecedent-pronoun dependency between the major subject and the embedded null subject that is licit because it involves a different type of dependency that is not subject to island constraints. A reductionist version of the same account would need to accept the proposal that these constructions involve two dependencies rather than one. It would also need to endorse the claim that the dependency between the gap in major subject position and the embedded null subject is a type of dependency that can be successfully processed simultaneously with relative clause structures, i.e., exactly the kind of simultaneous processing that such accounts argue to be impossible when *wh*-dependencies are involved. This would beg the question of why relative clauses and other island structures cannot be processed simultaneously with *wh*-dependencies, but can be processed simultaneously with other types of linguistic dependencies.

In effect, then, surface variation in island effects presents the same challenge for reductionist accounts raised in Section 4.4.

4.6 *Simultaneity does not matter: cross-language similarities in island effects*

Most existing reductionist accounts of islands have focused on English, a *wh*-fronting language. These accounts have highlighted the demands that are placed on the language processor when it is simultaneously holding an unassigned *wh*-filler in memory and processing an island structure, which is assumed to be more demanding than other types of structure. This simultaneity property plays a key role in reductionist explanations of why the demands of long extractions and island structures combine super-additively to yield island effects. Therefore, these accounts predict that island effects should disappear in situations where the two resource-hungry processes are not simultaneous.

Wh-in-situ phenomena in languages like Japanese have sometimes been offered as challenges for reductionist accounts of island effects (e.g., Lasnik 1999). If island effects are consequences of the difficulty of processing filler-gap dependencies, then surely a reductionist account predicts that *wh*-in-situ should fail to show island effects? Island effects are, in fact, found in *wh*-in-situ languages, although their distribution is often more restricted (Huang 1982; Lasnik & Saito 1992; Richards 2001). However, this argument against reductionist accounts is not so straightforward, because *wh*-in-situ does involve an unbounded dependency, and because the argument ignores the simultaneity assumption,

which is the key ingredient of the reductionist account of islands. Consider a Japanese *wh*-in-situ question like (50). Upon reaching the *wh*-phrase in the embedded clause a comprehender can immediately ascertain that he is processing a question, and that the *wh*-phrase is interpreted in an embedded clause. Although this avoids the search for a gap site that the corresponding English sentence would require, it does not complete the processing of the *wh*-phrase. The comprehender must determine the scope of the *wh*-phrase, i.e., whether the sentence is a direct question or an indirect question. In Japanese, this entails a search for an interrogative particle on a subsequent verb. The particle on the main clause verb in (50) indicates that the sentence is a direct question. On-line studies in Japanese suggest that this involves an active search process, similar to the search for gap sites in English (Miyamoto & Takahashi 2003; Aoshima, Phillips, & Weinberg 2004). Japanese is a strongly head-final language, and therefore the comprehender may also discover later in the sentence that he is, in fact, processing an island structure, such as a *wh*-island (51). Interrogative clauses are islands for adjunct questions in Japanese (Lasnik & Saito 1984, 1992). This island effect could be captured in a reductionist account of islands, since the *wh*-island structure is identified while the comprehender is engaged in the search for an interrogative particle, and hence the simultaneity condition is met.

50 John-wa [Mary-ga dare-ni sono hon-o ageta-to] itta-no?
John-TOP Mary-NOM who-DAT that book-ACC gave-COMP said-QP
 'Who did John say Mary gave a book to?'

51 *John-wa Mary-ga naze sore-o katta kadooka siritagatte iru no?
John-TOP Mary-NOM why it bought whether want.to.know QP
 'Why does John want to know [whether Mary bought it _]?'

In the Japanese example in (51) the simultaneity condition is met because Japanese is a head-final *wh*-in-situ language. The *wh*-island structure that triggers the island effect is not recognized until a late stage in the sentence, at which point the parser is simultaneously engaged in a search for an interrogative particle on a head-final verb. Japanese is thus the mirror-image of English, a head-initial *wh*-fronting language.

However, the simultaneity of building unbounded dependencies and island structures can be broken in 'mixed' situations, where either the unbounded dependency can be completed before the island structure is identified, or where the island structure is built before the unbounded dependency is initiated. Such cases can be found in Chinese and Hindi, which are *wh*-in-situ languages with a mix of head-initial and head-final phrases. The Chinese example in (52) shows a case where the *wh*-dependency can be completed before the island structure is recognized (Lasnik & Saito 1992). When the embedded *wh*-phrase *weisheme* ('why') is reached it should be clear that it has main clause scope, since the embedding verb *xiangxin* ('believe') does not select interrogative complement clauses. This should permit construction of the *wh*-dependency before the comprehender recognizes the head-final complex NP that creates an island effect. The Hindi example in (53) shows the reverse situation: the adjunct island structure can be recognized before the comprehender has evidence that the sentence is a *wh*-question (Malhotra 2009).

- 52 *Ni xiangxin [_{NP} [_{CP} Lisi weisheme lai] de shuofa]
 you believe Lisi why came DE claim
 'Why do you believe the claim that Lisi came __?'
- 53 *raam bazaar gayaa kyunki mira kyaa nahi layi
 Ram market went because Mira what not bought
 'What did Ram go to the market because Mira didn't bring __?'

The Chinese and Hindi examples in (52-53) are harder to accommodate within resource-based reductionist accounts of islands, because these accounts attribute island effects to the cost of simultaneously processing an incomplete *wh*-dependency and building an island structure. The two demands do not need to be satisfied simultaneously in the these examples, and therefore they are predicted to be more acceptable.

A reductionist account could perhaps try to accommodate the Chinese and Hindi island effects in (52-53) by assuming that they do, in fact, require simultaneous processing of a *wh*-dependency and an island structure, leading to the characteristic overload effect. In the case where the *wh*-dependency is completed before the island structure is identified (52), it is possible that the *wh*-dependency must be re-built once the island structure is identified. And in the case where the island structure is built before the *wh*-dependency is detected (53), perhaps the island structure must be re-processed when the *wh*-dependency is formed. This would amount to a modification of the reductionist account, such that processing overload is linked to all instances of simultaneously holding a *wh*-dependency and an island structure in memory, rather than to narrower scenarios in which breakdown is associated with simultaneously holding an incomplete *wh*-dependency in memory while constructing a complex island structure. This modification would immediately risk overgeneration of island effects. It is easy to construct sentences in which an unbounded dependency and an island structure must be simultaneously held in memory, but where no island effect occurs, because the *wh*-dependency does not span the boundary of the island structure. Both (54a) and (54b) contain an island structure (relative clause) and a *wh*-dependency, and so both require simultaneous representation of the two in memory, but in neither case does the *wh*-dependency span the island boundary, and both are acceptable.

- 54 a. Mary distrusts the man [_{RC} that you heard what he likes to watch __ on TV].
 b. What did Sally say that the politicians [_{RC} who were campaigning in the neighborhood] gave __ to the children?

Summarizing, resource-based reductionist accounts of islands claim that island effects are consequences of simultaneous processing of *wh*-dependencies and island structures, which leads to excessive difficulty. But island effect do not depend on this simultaneity.

4.7 *Reductionist accounts exacerbate the learning problem*

The final challenge for reductionist accounts of islands is not an empirical problem, but rather a challenge to the motivation for such accounts. It is sometimes claimed that reductionist accounts of islands are attractive because they lead to simplification of

grammatical theories. This is certainly true if we define the goal of a grammatical theory as merely to give the shortest possible characterization of the well-formed sentences of a language. But I take it to be a more pressing concern to explain how children rapidly and reliably learn the language in their environment, based only on positive examples of sentences from the language. In terms of this goal, it is less clear what is to be gained by shifting the burden of explanation for island effects from the grammar to the theory of language processing resource demands. In fact, this shift may make matters more difficult for the learner.

Consider first the case of an island effect that is universal, i.e., it applies in all languages. If the island effect is universal, then we may assume that is something that a child does not need to learn. (If children did, in fact, need to learn that island effect, then we would need an explanation for why it is immune to language change.) Children's input should also presumably not contain examples that violate the island, i.e., there should be a significant gap in the input corpus. If this gap reflects an innate, universal island constraint, then it should be neither informative nor troubling to the learner: it is expected based on the grammatical constraint. On the other hand, if the gap in the corpus reflects resource limitations rather than an explicit grammatical constraint, then the learner somehow needs to figure out that he should avoid drawing conclusions about the target grammar from the gap. And if the learner does choose to draw grammatical inferences from the gap in the corpus, then this raises the danger that he will draw incorrect inferences and mis-learn the island constraint.

On the other hand, if the island effect is non-universal, i.e., it applies in some languages but not in others, then the child has to learn about whatever property of the target language is responsible for the cross-language variation. If the variation is due to cross-language differences in grammatical constraints, then we face a familiar learning problem, albeit not an easy one. On the other hand, if the variation is due to cross-language variation in how language processing resources are deployed in language production and comprehension, then this is a problem that we have very little idea of how to address. It is unclear how children could learn about cross-language differences in resource deployment.

There is much more to be said about learning and island constraints, and this is the focus of the companion paper to this one. But for purposes of the current discussion it should be clear that removing island effects from the grammar to the domain of language processing resources does not make life any easier for the language learner. In fact, it might make it harder for the learner.

5. Challenges for Formal Accounts of Islands

The list of challenges for resource-based reductionist accounts of islands should not leave the impression that all is perfect for formal accounts of islands.

Formal grammatical accounts can, in principle, describe a wide array of island phenomena, because they are so powerful. When faced with a novel island effect, or a novel case of cross-language variation, it is easy to simply add a constraint or parameter to a grammatical account. Resource-based reductionist accounts make strong predictions about cross-language uniformity, individual differences, and so on, and for this reason they make relatively easy targets. Individual grammatical accounts of islands also make specific predictions, and so they are also easy to test. But it is harder to build arguments against

formal accounts in general, because they encompass so many possibilities. Therefore, the challenges are of a rather broad nature.

5.1 *Amelioration effects*

Resource-based reductionist accounts claim that island-violating sentences are grammatically well-formed, and that their perceived unacceptability is due to independent constraints on language processing. For this reason, advocates of resource-based reductionist accounts are impressed by sentences that appear to violate island constraints yet are perceived to be very natural. There are many such cases in the literature. A small sample is shown in (55).

- 55 a. *Complex NP Constraint* (Ross 1967; Deane 1991)
Which reports does the government prescribe [_{CP} the height of the lettering on ___]?
Nixon was one president that they had no problem finding [_{NP} votes for [_{NP} the impeachment of ___]]?
- b. *Relative clause island* (Chung & McCloskey 1983)
This is a paper that we really need to find someone [_{RC} who understands ___].
- c. *Adjunct island* (Truswell 2007, Hofmeister & Sag 2010)
What did John drive Mary crazy [_{adjunct} trying to fix ___]?
Among his most famous works are the Mass in C Minor and the Requiem, which he died before finishing ___.
- d. *Subject island* (Kluender 1998)
What were [_{subject} pictures of ___] seen around the globe?
- e. *Wh-island* (Chomsky 1973)
What crimes does the FBI know how to solve ___?
- f. *Coordinate Structure Constraint* (Ross 1967; Goldsmith 1985)
What did Harry [go to the store] and [buy ___]?
How much can you [drink ___] and [still stay sober]?

One thing that is clear about these ‘exceptional’ cases is that they are systematic. For each of the examples shown in (55) there are relatively good descriptions of what factors make the sentences more or less acceptable. What is less certain is what conclusions are to be drawn from these generalizations.

A first possibility is that the acceptable island violations have the same structure as their unacceptable counterparts, and that they reveal the true nature of the unacceptable sentences. This is what proponents of reductionist accounts take away from such examples. Under this view, examples like (55) show that the structures are grammatically well-formed, and that the unacceptability of island violations is due to independent constraints. This approach makes it relatively easy to accommodate the gradient acceptability that is revealed when the acceptable island violations are converted step-by-step into standard unacceptable island violations. This view also claims that the examples in (55) are not idiosyncratic, and therefore predicts that what distinguishes the acceptable and unacceptable instances of different island structures should be relatively uniform.

A second possibility, more commonly favored by advocates of grammatical accounts of islands, is that the acceptable island violations have a different structural representation

than the standard unacceptable cases, and that the surface resemblance is misleading. This view claims that these examples are similar to the cases of surface variation in island effects discussed in Section 4.5 above, i.e., the acceptable island violations have a different structural parse than their unacceptable counterparts. This view also predicts that the exceptional cases are idiosyncratic, and therefore that what distinguishes the acceptable and unacceptable island violations is likely to be different for each island type. Under this approach it is less straightforward to capture the cline of acceptability found when acceptable island violations are converted into unacceptable cases.

A third possibility, which I consider to be unlikely, is that the acceptable island violations actually are ungrammatical, but that they are ‘illusions of grammaticality’, similar to other cases of ill-formed sentences that are judged acceptable. Examples of these phenomena are shown in (56). (56a) is a comparative sentence that lacks a coherent interpretation (Montalbetti 1984; Wellwood, Pancheva, Hacquard, & Phillips submitted). (56b) is a case of a negative polarity item (*ever*) that is preceded but not c-commanded by a negative element (Vasishth, Brüssow, Lewis, & Drenhaus 2008; Xiang, Dillon, & Phillips 2009). (56c) shows an agreement violation (*the reviewer praise*) that is frequently judged as acceptable, due to the presence of a nearby plural noun (Bock & Miller 1991; Wagers, Lau, & Phillips 2009). (56d) is an example of a implausible passive sentence that is often interpreted with the more plausible meaning (Ferreira 2003). (56e) is a center-embedded sentence that is missing one verb, yet is often judged as at least as acceptable as a counterpart that has the correct number of verbs (Frazier 1985; Gibson & Thomas 1999). However, a characteristic property of grammatical illusions is that they either arise probabilistically, or that they are consistently judged as unacceptable when more time for reflection is available (Phillips, Wagers, & Lau 2011). The examples of acceptable islands do not appear to have this property.

- 56 a. More people have been to Russia than I have.
- b. The bills that no senators supported will ever become law.
- c. The musicians that the reviewer praise always attract a large audience.
- d. The dog was bitten by the man.
- e. The patient who the nurse who the clinic had hired met Jack.

The correct account of acceptable island violations remains unclear. Their mere existence certainly does not count as a fatal flaw for grammatical accounts of islands. But it is important that grammatical accounts take them as seriously as do reductionist accounts. Also, even if it is possible to attribute each case of acceptable island violations to an alternative structural parse, this raises questions about how children come to distinguish the acceptable and unacceptable cases.

5.2 *Variation and learning*

Formal grammatical accounts of islands are able to handle most of the challenges in Section 4 for the simple reason that they are very powerful, perhaps dangerously so. Whereas resource-based reductionist accounts of islands are challenged by evidence from systematic cross-language variation, formal accounts of islands can accommodate cross-language variation relatively easily. In some instances the variation can be shown to be

superficial: the variation reflects different structural representations rather than genuine variation in island constraints. We saw examples of such surface variation in Section 4.5 involving apparently escapable islands in Romance and East Asian languages. But in other cases we are currently forced to assume genuine cross-language variation in island constraints. This variation can easily be incorporated into formal grammatical accounts by simply adding another language-specific rule or parameter. But this comes at a potentially very high price. Universal island constraints do not need to be learned, but language-particular island constraints do need to be learned. And to date there are almost no accounts of how island constraints could be learned from the limited data available to children. Those who are skeptical of formal grammatical accounts of islands accurately see this as a serious flaw.

One impediment to serious attempts to model the learning of island constraints is that the scope of cross-language variation in island effects remains poorly understood. There is a lively debate surrounding the scope of cross-language variation in other domains (see Evans & Levinson 2009 and accompanying replies), but much of this discussion has focused on linguistic phenomena that are relatively easily observable, such as basic word order, clitic expression, or morphology. Such phenomena are convenient for large-scale typological studies or dialect surveys, as the data is easy to come by in descriptive grammars, corpora, or questionnaires. But for that reason those phenomena are also less interesting from a theoretical standpoint. We should not be troubled by rampant variation in easy-to-observe phenomena, since those phenomena should be relatively easy for children to observe and learn. It is more important to understand the scope of cross-linguistic variation in hard-to-observe phenomena, including island effects, as these are the kinds of phenomena that children presumably have to master based on limited and/or obscure evidence. Better understanding of cross-language variation in island effects should be a priority for future work on comparative syntax.

In this context, it is particularly interesting to encounter the claim that island constraints can be learned from the primary input data available to children. This is the provocative claim presented by Pearl and Sprouse (2011, this volume), and it is the focus of the companion paper to this one.

6. Conclusion of Part I

In this chapter I have focused on the diversity of island phenomena, both within and across languages, and how readily this diversity can be accommodated within formal grammatical accounts of islands, and accounts based on independently motivated properties of language processing. There is much appeal to reductionist accounts of islands, but this is no guarantee of their success.

Summarizing, there are at least 3 psycholinguistic phenomena associated with island effects that are compatible with grammatical and reductionist accounts alike (57).

- 57 a. Islands have early effects on active dependency processing in comprehension.
- b. Island-violating dependencies can be constructed, under duress.
- c. Satiation of island effects.

There are many challenges facing resource-based reductionist accounts of island effects. What matters here is not the sheer number of challenges, but the fact that so many of the premises of such accounts are not met (58).

- 58 a. There are island structures whose difficulty is not independently motivated.
- b. Active gap creation is possible inside islands, when allowed by the grammar of parasitic gaps.
- c. Lack of correlation between individual differences in working memory resources and island effects.
- d. Island structures do not block other types of active dependency formation.
- e. Constrained cross-language variation in island effects.
- f. Island effects are not dependent on the simultaneous processing of long-distance dependencies and island structures.
- g. Resource-based reductionist accounts may exacerbate the learning problem.

Finally, I emphasized that the challenges for reductionist accounts of islands should not invite complacency among advocates of grammatical accounts. This list is shorter than the list of challenges for reductionist accounts, but this does not diminish its importance. If advocates of grammatical accounts could answer the questions in (59) then they would go a long way towards calming their critics.

- 59 a. What is responsible for ‘acceptable island violations’?
- b. How do children come to know the island constraints of their target language, despite the evidence for cross-language variation and limited relevant input?

In Part II I turn attention to the question of how children come to know island constraints, and the feasibility of learning the constraints from the input that children encounter in their environment.

Acknowledgments

This work was supported in part by NSF Grant BCS-0848554. I am grateful for discussion of the material in this paper, stretching over many years, to Peter Cole, Nina Kazanina, Dave Kush, Jeff Lidz, Norbert Hornstein, Akira Omaki, Jon Sprouse, Matt Wagers, and Masaya Yoshida.

References

- Abrusán, M. (2011). Presuppositional and negative islands: A semantic account. *Natural Language Semantics*, 19, 257-321.
- Abrusán, M. (2011). *Wh*-islands in degree questions: A semantic approach. *Semantics and Pragmatics*, 4, 1-44.
- Aldwayan, S., Fiorentino, R., & Gabriele, A. (2010). Evidence of syntactic constraints in the processing of *wh*-movement: A study of Najdi Arabic learners of English. In B. VanPatten & J. Jegerski (eds.), *Research in second language processing and parsing*, pp. 65-86. Amsterdam: John Benjamins.

- Allwood, J. (1982). The complex NP constraint in Swedish. In E. Engdahl & E. Ejerhed (eds.), *Readings on unbounded dependencies in Scandinavian languages*, pp. 15-32. Stockholm: Almqvist & Wiksell.
- Ambridge, B. & Goldberg, A. (2008). The island status of clausal complements: Evidence in favor of an information structure explanation. *Cognitive Linguistics*, 19, 357-389.
- Aoshima, S., Phillips, C., & Weinberg, A. S. (2004). Processing filler-gap dependencies in a head-final language. *Journal of Memory and Language*, 51, 23-54.
- Aoshima, S., Yoshida, M., & Phillips, C. (2009). Incremental processing of coreference and binding in Japanese. *Syntax*, 12, 93-134.
- Berwick, R. & Weinberg, A. S. (1984). *The grammatical basis of linguistic performance*. Cambridge, MA: MIT Press.
- Bock, K. & Miller, C. A. (1991). Broken agreement. *Cognitive Psychology*, 23, 45-93.
- Boeckx, C. (2008). Islands. *Language and Linguistics Compass*, 2, 151-167.
- Bourdages, J. (1992). Parsing complex NPs in French. In H. Goodluck & M. Rochemont (eds.), *Island constraints: Theory, acquisition, and processing*, pp. 61-87. Dordrecht: Kluwer.
- Brandi, L. & Cordin, P. (1989). Two Italian dialects and the null subject parameter. In O. Jaeggli & K. Safir (eds.), *The null subject parameter*, pp. 111-142. Dordrecht: Kluwer.
- Chambers, S. M. & Forster, K. I. (1975). Evidence for lexical access in a simultaneous matching task. *Memory and Cognition*, 3, 549-559.
- Chomsky, N. (1964). *Current issues in linguistic theory*. The Hague: Mouton.
- Chomsky, N. (1965). *Aspects of the theory of syntax*. Cambridge, MA: MIT Press.
- Chomsky, N. (1973). Conditions on transformations. In S. Anderson & P. Kiparsky (eds.), *Festschrift for Morris Halle*, pp. 232-286. New York: Holt, Rinehart, & Winston.
- Chomsky, N. (1981). *Lectures on government and binding*. Dordrecht: Foris.
- Chomsky, N. (1986). *Barriers*. Cambridge, MA: MIT Press.
- Chomsky, N. (1995). *The minimalist program*. Cambridge, MA: MIT Press.
- Chomsky, N. (2001). Derivation by phase. In M. Kenstowicz (ed.), *Ken Hale: A life in language*, pp. 1-52. Cambridge, MA: MIT Press.
- Chung, S. (1982). Unbounded dependencies and Chamorro grammar. *Linguistic Inquiry*, 13, 39-77.
- Chung, S. & McCloskey, J. (1983). On the interpretation of certain island facts in GPSG. *Linguistic Inquiry*, 14, 704-713.
- Cinque, G. (1991). *Types of A' dependencies*. Cambridge, MA: MIT Press.
- Cinque, G. (1995). The pseudo-relative and ACC-ing constructions after verbs of perception. In G. Cinque (ed.), *Italian syntax and universal grammar*. Cambridge, UK: Cambridge University Press.
- Clements, G. N. (1984). Binding domains in Kikuyu. *Studies in the Linguistic Sciences*, 14, 37-56.
- Clifton, C. E., Jr. & Frazier, L. (1989). Comprehending sentences with long-distance dependencies. In M. K. Tanenhaus & G. N. Carlson (eds.), *Linguistic structure in language processing*, pp. 273-317. Dordrecht: Kluwer.
- Cole, P. & Hermon, G. (1994). Is there LF *wh*-movement? *Linguistic Inquiry*, 25, 239-262.
- Conway, A. R. A., Kane, M. J., Bunting, M. F., Hambridge, D. Z., Wilhelm, O., & Engle, R. W. (2005). Working memory span tasks: A methodological review and users guide. *Psychonomic Bulletin and Review*, 12, 769-786.

- Coulson, S., King, J. W., & Kutas, M. (1998). Expect the unexpected: Event-related brain response to morphosyntactic violations. *Language and Cognitive Processes, 13*, 21-58.
- Crain, S. & Fodor, J. D. (1985). How can grammars help parsers? In D. Dowty, L. Karttunen, & A. Zwicky (eds.), *Natural language parsing: psycholinguistic, computational, and theoretical approaches*, pp. 94-128. Cambridge University Press.
- Crain, S. & Fodor, J. D. (1987). Sentence matching and overgeneration. *Cognition, 26*, 123-169.
- Crawford, J. (2011). Using syntactic satiation to investigate subject islands. In *Proceedings of the 29th West Coast Conference on Formal Linguistics (WCCFL 29)*. Somerville, MA: Cascadilla Press.
- Culicover, P. & Postal, P., eds. (2001). *Parasitic gaps*. Cambridge, MA: MIT Press.
- Daneman, M. & Carpenter, P. A. (1980). Individual differences in working memory and reading. *Journal of Verbal Learning and Verbal Behavior, 19*, 450-466.
- Deane, P. (1991). Limits to attention: A cognitive theory of island phenomena. *Cognitive Linguistics, 2*, 1-63.
- Engdahl, E. (1982). Restrictions on unbounded dependencies in Swedish. In E. Engdahl & E. Ejerhed (eds.), *Readings on unbounded dependencies in Scandinavian languages*, pp. 151-174. Stockholm: Almqvist & Wiksell.
- Engdahl, E. (1983). Parasitic gaps. *Linguistics and Philosophy, 5*, 5-34.
- Engdahl, E. (1997). Relative clause extractions in context. *Working Papers in Scandinavian Syntax, 60*, 51-79.
- Eriksen, C. W. & Schultz, D. W. (1979). Information processing in visual search: A continuous flow conception and experimental results. *Perception and Psychophysics, 25*, 249-263.
- Erteschik-Shir, N. (1973). *On the nature of island constraints*. PhD dissertation, MIT.
- Evans, N. & Levinson, S. C. (2009). The myth of language universals: Language diversity and its importance for cognitive science. *Behavioral and Brain Sciences, 32*, 429-492.
- Ferreira, F. (2003). The misinterpretation of noncanonical sentences. *Cognitive Psychology, 47*, 164-203.
- Fiebach, C. J., Schlesewsky, M., & Friederici, A. D. (2002). Separating syntactic memory costs and syntactic integration costs during parsing: The processing of German *wh*-questions. *Journal of Memory and Language, 47*, 250-272.
- Fodor, J. D. (1978). Parsing strategies and constraints on transformations. *Linguistic Inquiry, 9*, 427-473.
- Fodor, J. D. (1983). Phrase structure parsing and the island constraints. *Linguistics and Philosophy, 6*, 163-223.
- Forster, K. I. & Stevenson, B. J. (1987). Sentence matching and well-formedness. *Cognition, 26*, 171-186.
- Francom, J. (2009). *Experimental syntax: Exploring the effect of repeated exposure to anomalous syntactic structure – evidence from rating and reading tasks*. PhD dissertation, University of Arizona.
- Frazier, L. (1985). Syntactic complexity. In D. Dowty, L. Karttunen, & A. Zwicky (eds.), *Natural Language Processing: Psychological, Computational, and Theoretical Perspectives*, pp. 129-189. Cambridge, UK: Cambridge University Press.
- Frazier, L. & Flores d'Arcais, G. (1989). Filler-driven parsing: A study of gap filling in Dutch. *Journal of Memory and Language, 28*, 331-344.

- Freedman, S. & Forster, K. I. (1985). The psychological status of overgenerate sentences. *Cognition*, 19, 101-131.
- Garnsey, S. M., Tanenhaus, M. K., & Chapman, R. M. (1989). Evoked potentials and the study of sentence comprehension. *Journal of Psycholinguistic Research*, 18, 51-60.
- Gazdar, G., Klein, E., Pullum, G. K., & Sag, I. A. (1985). *Generalized Phrase Structure Grammar*. Cambridge, MA: Harvard University Press.
- Georgopoulos, C. (1991). *Syntactic variables: Resumptive pronouns and binding in Palauan*. Dordrecht: Kluwer.
- Gibson, E. (1998). Linguistic complexity: Locality of syntactic dependencies. *Cognition*, 68, 1-76.
- Gibson, E. & Fedorenko, E. (in press). The need for quantitative methods in syntax and semantics research. *Language and Cognitive Processes*. DOI: 10.1080/01690965.2010.515080.
- Gibson, E. & Thomas, J. (1999). Memory limitations and structural forgetting: The perception of complex ungrammatical sentences as grammatical. *Language and Cognitive Processes*, 14, 225-248.
- Goldsmith, J. (1985). A principled exception to the Coordinate Structure Constraint. In *Papers from the twenty-first annual regional meeting of the Chicago Linguistic Society*. Chicago: Chicago Linguistic Society.
- Goodall, G. (2011). Syntactic satiation and the inversion effect in English and Spanish *wh*-questions. *Syntax*, 14, 29-47.
- Gouvea, A., Phillips, C., Kazanina, N., & Poeppel, D. (2010). The linguistic processes underlying the P600. *Language and Cognitive Processes*, 25, 149-188.
- Grimshaw, J. (1986). Subjacency and the S/S' parameter. *Linguistic Inquiry*, 17, 364-369.
- Hahne, A. & Friederici, A. D. (1999). Electrophysiological evidence for two steps in syntactic analysis: Early automatic and late controlled processes. *Journal of Cognitive Neuroscience*, 11, 194-205.
- Han, C. & Kim, J. (2004). "Double relative clauses" in Korean? *Linguistic Inquiry*, 35, 315-337.
- Hawkins, J. A. (1999). Processing complexity and filler-gap dependencies across languages. *Language*, 75, 224-285.
- Hiramatsu, K. (2000). *Accessing linguistic competence: Evidence from children's and adults' acceptability judgments*. PhD dissertation, University of Connecticut.
- Hofmeister, P. & Sag, I. A. (2010). Cognitive constraints on syntactic islands. *Language*, 86, 366-415.
- Hofmeister, P., Staum Casasanto, L., & Sag, I. (this volume). Islands in the grammar: Evidence and non-evidence.
- Hoshi, K. (2004). Parameterization of the external D-system in relativization. *Language, Culture, and Communication*, 33, 1-50.
- Hsu, C.-C. N. (2006). Issues in head-final relative clauses in Chinese: Derivation, processing, and acquisition. PhD dissertation, University of Delaware.
- Huang, C.-T. J. (1982). *Logical relations in Chinese and the theory of grammar*. PhD dissertation, MIT.
- Ishizuka, T. (2009). CNPC violations and possessor raising in Japanese. Ms. UCLA.

- Kane, M. J., Conway, A. R. A., Miura, T. K., & Colfesh, G. J. H. (2007). Working memory, attention control, and the *n*-back task: A question of construct validity. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *33*, 615-622.
- Karttunen, L. (1977). Syntax and semantics of questions. *Linguistics and Philosophy*, *1*, 3-44.
- Kaschak, M. P. & Glenberg, A. M. (2004). This construction needs learned. *Journal of Experimental Psychology: General*, *133*, 450-467.
- Kayne, R. (1983). Connectedness. *Linguistic Inquiry*, *14*, 223-249.
- Kazanina, N., Lau, E. F., Lieberman, M., Yoshida, M., & Phillips, C. (2007). The effect of syntactic constraints on the processing of backwards anaphora. *Journal of Memory and Language*, *56*, 384-409.
- Kazanina, N. & Phillips, C. (2010). Differential effects of constraints in the processing of Russian cataphora. *Quarterly Journal of Experimental Psychology*, *63*, 371-400.
- Kenstowicz, M. (1989). The null subject parameter in modern Arabic dialects. In O. Jaeggli & K. Safir (eds.), *The null subject parameter*, pp. 263-275. Dordrecht: Kluwer.
- King, J. & Kutas, M. (1995). Who did what and when? Using word- and clause-level ERPs to monitor working memory usage in reading. *Journal of Cognitive Neuroscience*, *7*, 376-395.
- Kiss, K. É. (1987). *Configurationality in Hungarian*. Dordrecht: Reidel.
- Kluender, R. (1998). On the distinction between strong and weak islands: A processing perspective. In P. Culicover & L. McNally (eds.), *Syntax and Semantics 29: The limits of syntax*, pp. 241-279. San Diego, CA: Academic Press.
- Kluender, R. (2005). Are subject islands subject to a processing account? In V. Chand, A. Kelleher, A. J. Rodriguez, & B. Schmeiser (eds.), *Proceedings of the 23rd West Coast Conference on Linguistics*, pp. 475-499.
- Kluender, R. (this volume). *[insert title here]*
- Kluender, R. & Kutas, M. (1993). Subjacency as a processing phenomenon. *Language and Cognitive Processes*, *8*, 573-633.
- Kroch, A. (1989). Amount quantification, referentiality, and long *wh*-movement. Ms., University of Pennsylvania.
- Kuno, S. (1976). Subject, theme, and speaker's empathy – a reexamination of relativization phenomena. In C. Li (ed.), *Subject and topic*, pp. 417-444. Academic Press.
- Kush, D. (2011). On the escapability of islands in Scandinavian. Ms. University of Maryland.
- Lasnik, H. (1999). On the locality of movement. In M. Darnell, E. Moravcsik, F. Newmeyer, M. Noonan, & K. Wheatley (eds.), *Functionalism and formalism in linguistics: Volume 1, general papers*, pp. 33-54. Amsterdam: John Benjamins.
- Lasnik, H. & Saito, M. (1984). On the nature of proper government. *Linguistic Inquiry*, *15*, 235-289.
- Lasnik, H. & Saito, M. (1992). *Move alpha: Conditions on its application and output*. Cambridge, MA: MIT Press.
- Lee, M.-W. (2004). Another look at the role of empty categories in sentence processing (and grammar). *Journal of Psycholinguistic Research*, *33*, 51-73.
- Lewis, R. L., Vasishth, S., & Van Dyke, J. A. (2006). Computational principles of working memory in sentence processing. *Trends in Cognitive Sciences* *10*, 447-454.
- Lohndal, T. (2009). Comp-t effects: Variation in the position and features of C. *Studia Linguistica*, *63*, 204-232.

- Luka, B. J. & Barsalou, L. W. (2005). Structural facilitation: Mere exposure effects for grammatical acceptability as evidence for syntactic priming in comprehension. *Journal of Memory and Language*, 52, 436-459.
- Mahajan, A. (1990). *The A/A-bar distinction and movement theory*. PhD dissertation, MIT.
- Malhotra, S. (2009). On *wh*-quantifier interactions. Ms. University of Maryland.
- Manzini, M. R. (1992). *Locality: A theory and some of its empirical consequences*. Cambridge, MA: MIT Press.
- McCloskey, J. (1989). Resumptive pronouns, A'-binding, and levels of representation in Irish. In R. Hendrick (ed.), *Syntax and semantics 23: The syntax of the modern Celtic languages*, pp. 199-248. New York: Academic Press.
- McCloskey, J. (2000). Quantifier float and *wh*-movement in an Irish English. *Linguistic Inquiry*, 31, 57-84.
- McElree, B., Foraker, S., & Dyer, L. (2003). Memory structures that subserve sentence comprehension. *Journal of Memory and Language*, 48, 67-91.
- McElree, B. & Griffith, T. (1998). Structural and lexical constraints on filling gaps during sentence processing: A time-course analysis. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, 24, 432-460.
- McKinnon, R. & Osterhout, L. (1996). Event-related potentials and sentence processing: Evidence for the status of constraints on movement phenomena. *Language and Cognitive Processes*, 11, 495-523.
- Michel, D. (2011). Individual differences inform the syntax-processing island debate. Talk at *Islands in Contemporary Linguistic Theory*. Vitoria-Gasteiz, University of the Basque Country.
- Montalbetti, M. (1984). *After binding*. PhD dissertation, MIT.
- Myers, J. (2006). An experiment in minimalist experimental syntax. Ms. National Chung Cheng University.
- Neville, H. J., Nicol, J., Barss, A., Forster, K. I., & Garrett, M. F. (1991). Syntactically based sentence processing classes: Evidence from event-related brain potentials. *Journal of Cognitive Neuroscience*, 3, 151-165.
- Nordgaard, T. (1985). *Word order, binding, and the empty category principle*. Cand. Philol. thesis, University of Trondheim.
- Omaki, A., Davidson White, I., Goro, T., Lidz, J., & Phillips, C. (submitted). No fear of commitment: Children's incremental interpretation in English and Japanese *wh*-questions.
- Omaki, A. & Schulz, B. (2011). Filler-gap dependencies and island constraints in second language sentence processing. *Studies in Second Language Acquisition*, 33, 563-588.
- Pearl, L. & Sprouse, J. (submitted). Syntactic islands without Universal Grammar: A computational model of the acquisition of constraints on long-distance dependencies.
- Pearl, L. & Sprouse, J. (*this volume*). Computational models of acquisition for islands. In J. Sprouse & N. Hornstein (eds.): *Experimental syntax and island effects*. Cambridge University Press.
- Perlmutter, D. (1971). *Deep and surface structure constraints in syntax*. New York: Holt, Rinehart, & Winston.
- Pesetsky, D. (1987). *Wh*-in-situ: movement and unselective binding. In E. Reuland & A. ter Meulen (eds.), *The representation of (in)definiteness*, pp. 98-129. Cambridge, MA: MIT Press.

- Phillips, C. (2006). The real-time status of island phenomena. *Language*, 82, 795-823.
- Phillips, C. (2011). Some arguments and non-arguments for reductionist accounts of syntactic phenomena. *Language and Cognitive Processes*. Published online 26 Jul 2011. DOI 10.1080/01690965.2010.530960.
- Phillips, C., Kazanina, N., & Abada, S. (2005). ERP effects of the processing of syntactic long-distance dependencies. *Cognitive Brain Research*, 22, 407-428.
- Phillips, C., Wagers, M. W., & Lau, E. F. (2011). Grammatical illusions and selective fallibility in real-time language comprehension. In: J. Runner (ed.), *Experiments at the Interfaces, Syntax and Semantics, vol. 37*, pp. 153-186. Bingley, UK: Emerald.
- Pickering, M. J., Barton, S., & Shillcock, R. (1994). Unbounded dependencies, island constraints, and processing complexity. In C. Clifton, Jr., L. Frazier, & K. Rayner (eds.), *Perspectives on sentence processing*, pp. 199-224. London: Erlbaum.
- Pollard, C. & Sag, I. A. (1994). *Head-driven phrase structure grammar*. University of Chicago Press.
- Prince, A. & Smolensky, P. (1993). *Optimality theory: Constraint interaction in generative grammar*. Technical Report #2, Center for Cognitive Science, Rutgers University.
- Pritchett, B. L. (1991). Subjacency in a principle-based parser. In R. C. Berwick, S. P. Abney, & C. Tenny (eds.), *Principle-based parsing: Computation and psycholinguistics*, pp. 301-345. Dordrecht: Kluwer.
- Rafel, J. (2000). From complementizer to preposition. *Probus*, 12, 67-92.
- Richards, N. (2001). *Movement in language: Interactions and architectures*. Oxford University Press.
- Rizzi, L. (1982). *Issues in Italian syntax*. Dordrecht: Foris.
- Rizzi, L. (1990). *Relativized minimality*. Cambridge, MA: MIT Press.
- Roberts, I. & Holmberg, A. (2010). Introduction: Parameters in minimalist theory. In T. Biberauer, A. Holmberg, I. Roberts, & M. Sheehan (eds.), *Parametric variation: Null subjects in minimalist theory*, pp. 1-58. Cambridge, UK: Cambridge University Press.
- Roberts, R. & Gibson, E. (2002). Individual differences in sentence memory. *Journal of Psycholinguistic Research*, 31, 573-598.
- Ross, J. R. (1967). *Constraints on variables in syntax*. PhD dissertation, MIT.
- Rudin, C. (1988). On multiple questions and multiple *wh*-fronting. *Natural Language and Linguistic Theory*, 6, 445-501.
- Saito, M. (1985). *Some asymmetries in Japanese and their theoretical implications*. PhD dissertation, MIT.
- Sakai, H. (1994). Complex NP constraint and case conversions in Japanese. In M. Nakamura (ed.), *Current topics in English and Japanese*, pp. 179-203. Tokyo: Hituzi Syobo.
- Smolensky, P. & Legendre, G. (2006). *The harmonic mind*. Cambridge, MA: MIT Press.
- Snyder, W. (2000). An experimental investigation of syntactic satiation effects. *Linguistic Inquiry*, 31, 575-582.
- Sportiche, D. (1981). Bounding nodes in French. *The Linguistic Review*, 1, 219-246.
- Sprouse, J. (2009). Revisiting satiation: Evidence for a response equalization strategy. *Linguistic Inquiry*, 40, 329-341.
- Sprouse, J. (this volume). Defining the terms of the debate: Reductionist theories and the superadditive nature of island effects.
- Sprouse, J., Wagers, M., & Phillips, C. (2012). A test of the relation between working memory capacity and syntactic island effects. *Language*.

- Stepanov, A. (2007). The end of CED: Minimalism and extraction domains. *Syntax*, 10, 80-126.
- Stevenson, B. (1999). Case study in information processing: Sentence processing. In J. Wiles & T. Dartnall (eds.), *Perspectives on cognitive science: Theories, experiments, and foundations*, pp. 277-292. Norwood, NJ: Ablex.
- Stowe, L. A. (1986). Parsing WH-constructions: Evidence for on-line gap location. *Language and Cognitive Processes*, 3, 227-245.
- Stowe, L. A. (1992). The processing implementation of syntactic constraints: The sentence matching debate. In H. Goodluck & M. Rochemont (eds.), *Island constraints: Theory, acquisition, and processing*, pp. 419-443. Dordrecht: Kluwer.
- Szabolcsi, A. & den Dikken, M. (1999). Islands. *GLOT International*, 4, 3-8.
- Szabolcsi, A. & Zwarts, F. (1993). Weak islands and an algebraic semantics of scope taking. *Natural Language Semantics*, 1, 235-284.
- Taraldsen, K. T. (1982). Extraction from relative clauses in Norwegian. In E. Engdahl & E. Ejerhed (eds.), *Readings on unbounded dependencies in Scandinavian languages*, pp. 205-221. Stockholm: Almqvist & Wiksell.
- Tokimoto, S. (2009). Island phenomenon in Japanese and working memory: Syntactic constraints independent from working memory constraints. Poster presented at the 22nd annual CUNY Sentence Processing Conference, Davis, CA.
- Torrego, E. (1984). On inversion in Spanish and some of its effects. *Linguistic Inquiry*, 15, 103-129.
- Traxler, M. J. & Pickering, M. J. (1996). Plausibility and the processing of unbounded dependencies: An eye-tracking study. *Journal of Memory and Language*, 35, 454-475.
- Truswell, R. (2007). Extraction from adjuncts and the structure of events. *Lingua*, 117, 1355-1377.
- van Gompel, R. & Liversedge, S. (2003). The influence of morphological information on cataphoric pronoun assignment. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 29, 128-139.
- Vasishth, S., Brüßow, S., Lewis, R., & Drenhaus, H. (2008). Processing polarity: How the ungrammatical intrudes on the grammatical. *Cognitive Science*, 32, 685-712.
- Wagers, M. W. (this volume). Memory mechanisms for *wh*-dependency formation and their implications for islandhood.
- Wagers, M. W., Lau, E. F., & Phillips, C. (2009). Agreement attraction in comprehension: Representations and processes. *Journal of Memory and Language*, 61, 206-237.
- Wagers, M. W. & Phillips, C. (2009). Multiple dependencies and the role of the grammar in real-time comprehension. *Journal of Linguistics*, 45, 395-433.
- Wagers, M. W. & Phillips, C. (submitted). Going the distance: memory and decision making in active dependency construction.
- Wellwood, A., Pancheva, R., Hacquard, V., & Phillips, C. (submitted). Deconstructing a comparative illusion.
- Xiang, M., Dillon, B. W., & Phillips, C. (2009). Illusory licensing effects across dependency types: ERP evidence. *Brain and Language*, 108, 40-55.
- Yoshida, M. (2006). *Constraints and mechanisms in long-distance dependency formation*. PhD dissertation, University of Maryland.

Yoshida, M., Aoshima, S., & Phillips. (2004). Relative clause prediction in Japanese. Talk at the 17th Annual CUNY Conference on Human Sentence Processing. University of Maryland, College Park, March.

Yoshida, M., Kazanina, N., Pablos, L., & Sturt, P. (to appear). On the origin of islands. *Language and Cognitive Processes*.

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