1 Experimental syntax and island effects: Toward a comprehensive theory of islands

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1 Introduction

One of the most pervasive properties of human language is the existence of *dependencies*: necessary relationships that hold between two elements in a sentence. The primary objects of study in this volume are *long-distance "filler-gap" dependencies* – a special subset of dependencies that are not constrained by standard measures of length such as number of words or number of clauses. For example, wh-questions in English (1) contain a long-distance dependency between the wh-word at the beginning of the sentence and a theta-role assigning element (such as a verb or preposition) later in the sentence that selects the wh-word as a semantic argument. We will adopt a relatively theory-neutral terminology and call the end of this dependency the *gap position*, indicated by an underscore in examples. The pattern in (1a–1c) suggests that long-distance dependency between wh-words and gap positions in English can be separated by any number of embedded sentences:[1]

(1) a. What does Susan think that John bought __?
b. What does Sarah believe that Susan thinks that John bought __?
c. What does Bill claim that Sarah believes that Susan thinks that John bought __?

Although wh-dependencies tend to be used as the canonical example of long-distance dependencies in the linguistic literature, there are many different constructions in the world's languages that contain long-distance dependencies. For example, other English long-distance dependencies include relativization (2a), topicalization (2b), adjective-though constructions (2c), and various types of clefts (2d), among others:

[1] Clearly there is an upper limit to the length of sentences that a human speaker can understand. However, this is true of sentences that contain long-distance dependencies and sentences that do not, suggesting that the eventual parsing failure is not due to the presence of long-distance dependencies. Instead, it is likely a consequence of the limited memory resources available for tracking the entities and relationships described by the sentence.

(2) a. I like the car that John bought __.
b. I like most of these cars, but that car, I love __.
c. Fast though the sports car is __, I prefer the hybrid.
d. This is the car that John bought __.

Although long-distance dependencies are not constrained by standard measures of length, this does not mean that all long-distance dependencies are acceptable. Crucially, when the gap position of a long-distance dependency is inside certain structures, the sentence becomes unacceptable:[2]

(3) a. *What do you wonder [$_{CP}$ whether John bought __]?
b. *What did you make [$_{NP}$ the claim that John bought __]?
c. *What do you think [$_{NP}$ the speech about __] interrupted the TV show?
d. *What do you worry [$_{CP}$ if John buys __]?
e. *What did you meet [$_{RC}$ the scientist who invented __]?
f. *What did [$_{CP}$ that John wrote __] offend the editor?
g. *What did John buy [$_{ConjP}$ a shirt and __]?
h. *Which did John borrow [$_{NP}$ __ book]?

Ross (1967) used the metaphorical term *island* to refer to these "gap-resistant" structures, evoking the idea that the wh-word could not *move* from the gap-position inside the island to the front of the sentence.[3] Building on this, we will use the term *island effect* to refer to the unacceptability that arises when a gap position occurs within an island.[4] It is also common in the literature to refer to island effects based on the structure that creates them: WH-islands (3a), Complex Noun Phrase islands (3b), Subject islands (3c), Adjunct islands (3d), Relative Clause islands (3e), and Sentential Subject islands (3f), although some island types are more commonly referred to based on the proposed constraint that they violate, as in Coordinate Structure Constraint violations (3g) and Left Branch Extraction violations (3h).

[2] Some terminology: "(un)acceptability" is used when describing speaker judgments. These are often referred to in the literature as "grammaticality judgements." However, this is misleading for at least two reasons. First, grammaticality is at most one factor determining acceptability. Second, acceptability is a descriptive predicate that describes the observable data, while grammaticality is a predicate that describes the mental representations that linguists theoretically invoke to (at least partially) explain this data. Speakers have privileged access to their acceptability judgments. Nobody's grammaticality judgments are dispositive. See below for further discussion.

[3] While it is true that this was originally a theory-laden metaphor (invoking the idea of movement that is central to transformational grammar), the term itself has been adopted by nearly all linguistic theories, therefore we will continue to use it here. A historical note: Ross (1967) attributed island effects to the illicit application of "chopping" rules within islands. Movement from islands was permitted. The prohibition against movement from islands is proposed in later accounts that built on Ross's earlier work, most especially Chomsky's Subjacency Theory (1973, 1981, 1986).

[4] We have chosen the term *island effect* over the more common *island violation* because the former is agnostic about the source of the unacceptability (the primary question driving this volume), while the latter specifically refers to the violation of a specific (likely grammatical) constraint.

As an acceptability-based phenomenon, the source of island effects has long been a topic of debate within the linguistic and psycholinguistic literature. The problem lies in the fact that acceptability judgments are a behavioral response that is the result of successful sentence processing (Chomsky 1965, Schütze 1996, Sprouse and Almeida 2013), and as such could be influenced by any of the cognitive systems that are implicated in successful sentence processing, from the multiple mental representations that can be used to characterize a sentence (e.g., phonological, morphological, syntactic, semantic, pragmatic), to the different components of the parsing system that must be deployed during normal sentence comprehension (e.g., structure-building operations, ambiguity resolution heuristics, working memory systems). In short, this is the classic problem of cognitive science (mapping observable behavioral responses to unobservable cognitive constructs), exacerbated by the complexity and multi-level nature of human language. The primary empirical goal of this volume is to bring the techniques of experimental syntax (broadly construed) to bear on this particular instantiation of the cognitive science problem, and move the field one step closer to identifying the source of island effects.

2 Components of a comprehensive theory of island effects

Even from the brief introduction to island effects presented above, it should be clear that identifying the source of island effects requires much more than a simple catalog of the constructions that demonstrate them. Experimental syntax provides a set of tools that goes beyond the traditional acceptability judgment experiments that have been used (to good success) in the existing literature. Our hope is that these tools may reveal new types of data that bear on this question. The logical place to begin the search for new evidence is by reviewing the complex patterns of island effects, both across languages and across construction types, that have been previously reported in the syntax literature. These patterns are useful to our goals in at least two ways. First, they provide a starting point for thinking about the types of evidence that could be used to isolate the source of island effects. It is our hope that the chapters in this volume will use some of these complex patterns to tease apart the role of different levels of linguistic representation and processing in explaining the unacceptability of island effects. Second, these patterns present a list of phenomena that any comprehensive theory of island effects must explain. It is not enough for a theory of island effects to simply explain the unacceptability of island effects in one language or one construction; a comprehensive theory must also explain the complex pattern that is observed across languages and across constructions.

Table 1.1 *Cross-linguistic variation in island effects*

	WH	Complex NP	Subject	Adjunct	Relative Clause
English	*	*	*	*	*
Italian	–	*	?	*	*
Spanish	–	*	?	*	*
Portuguese	–	*	?	*	*
French	?	*	*	*	*
German	*	*	?	*	*
Russian	*	*	?	*	*
Scandinavian	–	–	–	–	?
Hungarian	?	*	?	*	*

2.1 Variation in languages with overt long-distance dependencies

Perhaps the most obvious fact that a comprehensive theory must explain is the cross-linguistic variability of island effects. As illustrated in (3) above, English demonstrates at least eight different types of island effects; however, several languages demonstrate fewer. Table 1.1 presents nine languages that are known to employ wh-movement in questions, and five of the most studied island effects: WH-islands (3a), Complex Noun Phrase islands (3b), Subject islands (3c), Adjunct islands (3d), and Relative Clause islands (3e). The diacritics indicate whether the specified language demonstrates that particular island effect: asterisks indicate that the island effect arises in that language, dashes indicate that the island effect does not arise in that language, and question marks indicate that the island effect arises for some sentence types, but not others. We should note that Table 1.1 idealizes the empirical results to a considerable extent. There has been considerable work on these cross-linguistic differences and the differences noted here are not nearly as categorical as displayed. For example, many English speakers treat the wh-island violations discussed in Rizzi 1982b as acceptable (c.f. Grimshaw 1986). Furthermore, it has long been noted that the degrees of unacceptability substantially differ across the various islands. For example, violations of the WH-island condition are generally less unacceptable than violations of the relative clause version of the Complex Noun Phrase Constraint. This said, the table offers a good approximation of the received wisdom, though the information it encodes should be treated as a potential object of study. For discussion of these matters see chapter 3 (Hofmeister *et al.*), chapter 4 (Phillips), chapter 11 (Kush *et al.*), chapter 12 (Jurka), chapter 13 (Polinsky *et al.*).

To the extent that Table 1.1 is accurate, the cross-linguistic variation it reports raises some very interesting questions for theories of island effects. For

example, it has proven relatively difficult to characterize precisely the variability indicated by question marks; that is, island effects in certain languages that appear arise for some sentences, but not others. Furthermore, the mere existence of variability has proven challenging for approaches to island effects that postulate a source that is outside of the grammar (e.g., components of the sentence processing system), as grammatical theories have traditionally been the sole locus of cross-linguistic variation.

Although Table 1.1 suggests that there is a good amount of variation cross-linguistically, at least two patterns are suggested by this (limited) sample of languages. The first is the relatively robust correlation between a lack of WH-island effects and at least a partial lack of Subject island effects, as seen in several Romance languages. The facts underlying this correlation led Rizzi (1982b) to propose what is now one of the most famous theories of island variation (see also Torrego 1984 for an extension to Spanish). Rizzi's proposal was predicated upon Chomsky's (1973) analysis of island effects, which postulated a constraint on the wh-movement operation that Chomsky called the Subjacency Condition. The Subjacency Condition held that wh-movement must target landing sites (primarily spec, CPs) that are *subjacent* to the gap position, where *subjacent* was defined as crossing fewer than two *bounding nodes*, and bounding nodes were defined as any NP or IP that dominated the gap position. In effect, the Subjacency constraint meant that a single instance of wh-movement only operated within a single CP: a wh-word could move from its gap position within the clause to the specifier of the local CP, but not farther, because this one-clause movement would cross one bounding node (the IP), but two-clause movement would necessarily cross at least two bounding nodes (the embedded IP and the matrix IP).

Although this proposal that wh-movement is bounded amounted to a radical shift from Ross's (1967) analysis, in which wh-movement was an unbounded operation, it crucially provided a mechanism for capturing island effects. Although we won't demonstrate the analyses here, the Subjacency analysis captured WH-islands by making the first spec, CP position unavailable as a landing site (because it is filled with a wh-word), thus forcing wh-movement to violate Subjacency by crossing two bounding nodes (the IP of the embedded clause and the IP of the matrix clause). The Subjacency analysis also captured Subject islands (which were discovered later by Huang 1982a), as movement out of the subject NP required wh-movement to cross two bounding nodes (the subject NP and the IP).[5]

[5] The original Subjacency analysis was not without problems, even for English. It could not account for Complex NP, Relative Clause, and Adjunct islands without additional assumptions. Furthermore, it wrongly predicted that movement out of NPs in object position should be unacceptable (i.e., an Object island to parallel Subject islands). Chomsky (1986) attempted to

Rizzi (1982b) argued that the success of the Subjacency analysis at capturing WH-islands (and later Subject islands) was a problem for languages like Italian, as Italian allows long-distance dependencies (in this case, relative clause dependencies) to have a gap position inside of embedded questions, which is the canonical WH-island configuration:

(4) Absence of WH-island effects in Italian
   a. Il solo incarico che non sapevi a chi avrebbero affidato è poi finito proprio a te.
      the only task that not knew.2SG to whom have.3PL.COND assigned is then ended_up right to you
      'The only task that you didn't know who they would assign_to was then given right to you.'
   b. Tuo fratello, a cui mi domando che storie abbiano raccontato, era molto preoccupato.
      your brother, to whom myself ask.1SG what stories have.3PL told, was very worried
      'Your brother, who I wonder what stories they told __, was very worried.'

Crucially, Rizzi did observe other island types in Italian, such as Complex NP islands:

(5) Presence of NP island effects in Italian
   a. *Questo incarico, che non sapevo la novità che avrebbero affidato a te, . . .
      this task, that not knew.1SG the news that have.3PL.COND assigned to you
      'This task, which I didn't know the news that they would assign __ to you, . . . '
   b. *Tuo fratello, a cui temo la possibilità che abbiano raccontato tutto, . . .
      your brother, to whom fear.1SG the possibility that have.3PL told everything
      'Your brother, who I am afraid of the possibility that they have told __ everything . . . '

From these facts Rizzi argued that Italian relative clause formation must involve successive cyclic movement and the Subjacency Condition; however, Rizzi also argued that the bounding nodes for Italian could not be NP and IP, as that would lead to WH-islands. Instead, Rizzi proposed that the choice of bounding nodes be a parameter that could vary across languages. In order to capture the presence of Complex NP islands and the absence of WH-islands, Rizzi proposed that the bounding nodes in Italian should be NP and CP. Torrego (1984) later confirmed that this parametric theory of Subjacency would correctly account for the island facts in Spanish, as well as the apparent correlation between WH-island effects

correct these problems, as well as unify the definition of *bounding node* from the Subjacency Condition and *barrier* from the Empty Category Principle. Although this attempt is now generally considered a failure, it remains a classic example of two of the primary goals of high-level syntactic theorizing: correcting empirical inadequacies of previous analyses while reducing the number of objects in the ontology of the theory.

(which are predicated upon IP bounding nodes) and Subject island effects (which are also predicated upon IP bounding nodes) that is suggested by the Italian and Spanish facts (see also Sportiche 1981 for French).

Whereas the first pattern in Table 1.1 primarily concerns Romance languages, the second pattern concerns Scandinavian languages (Swedish, Norwegian, Danish, and Icelandic). As first observed by Engdahl (1980) for Swedish, Scandinavian languages do not demonstrate any of these five island effects.[6] Engdahl (1980) argued this leaves only two options. Option one is to allow unboundedness in the parametric theory, such that wh-movement in Scandinavian can be unbounded. The second option is to allow Scandinavian CPs to have multiple specifier positions. The discovery of Subject islands in the intervening years means that this second option must be augmented by setting the bounding nodes in Scandinavian to NP and CP (because Subject islands are caused by NP and IP being bounding nodes, regardless of the number of spec, CP positions available). In either case, the existence of apparently island-less languages such as modern Scandinavian languages raises interesting challenges for any comprehensive theory of island effects.

All Subjacency-like accounts of islands have four parts: (i) a proposal for measuring the size of a given movement step, (ii) a principle that limits the step size of any given movement, (iii) a specification of which nodes permit escape ("escape hatches"), and (iv) a specification of how many slots an escape hatch has. The variation noted in Table 1.1 is accounted for by parameterizing one (or more) of these four basic features. Much theoretical work has concentrated on trying to rationalize these four features (e.g., why some nodes count for measuring step size and some do not) and exploring the analytic options of varying one or another assumption. Perhaps the most interesting consequence of Subjacency-like accounts of islands is how they tied together island effects with the requirement that all long-distance movement be successive cyclic. In other words, Subjacency implies successive cyclicity. In fact, early work by Kayne and Pollock (1978) and Torrego (1984) attempted to provide empirical evidence for successive cyclic movement.

2.2 *Wh-in-situ and the argument/adjunct distinction*

A comprehensive theory of island effects must not only account for the pattern of variation observed in languages with overt long-distance dependencies (e.g., wh-movement), but also for the pattern of island effects that have been observed

[6] Swedish is not bereft of apparent island effects. Rather it does not display island effects in all contexts where they are theoretically expected to appear (and as they do appear in English). For example, there are some unacceptable instances of extracting out of complex noun phrases, but others seem perfectly fine. For some discussion see chapter 11 (Kush *et al.*).

in languages without overt long-distance dependencies. The primary example of this is the argument/adjunct distinction that has been observed in so-called wh-in-situ languages such as Chinese (Huang 1982a), Japanese (Lasnik and Saito 1984), and Sinhala (Hagstrom 1998). In wh-in-situ languages, question formation does not involve displacement of the wh-word: the wh-word appears in the same position that the questioned constituent would appear in a declarative sentence (i.e., the gap-position in wh-movement languages). Given that there is no overt long-distance dependency in wh-in-situ languages, one might expect that there are also no island effects in wh-in-situ languages. At least for wh-arguments such as *who* and *what*, this prediction appears to hold (illustrated here for an Adjunct island in Japanese):

(6) [John-wa [$_{ADJ}$ kare-no okusan-ga nani-o katta kara] okoru-to no]?
J-top he-gen wife-nom what-acc bought because get.angry-Q?
'What would John get angry because his wife bought t_{what}?'

However, wh-adjuncts such as *why* and *how* cannot appear inside of island structures in wh-in-situ languages:

(7) *[John-wa [$_{ADJ}$ kare-no okusan-ga naze atarasii doresu-o katta kara]
J-top he-gen wife-nom why new dress-acc bought because
okoru-to no]?
get.angry Q?
'Why would John get angry because his wife bought a new dress t_{why}?'

This pattern suggests that wh-in-situ languages do indeed display island effects, but that the underlying source of island effects in wh-in-situ languages is conditioned by the argument/adjunct distinction.

Much like the variation observed with wh-movement languages, the most famous analysis of the argument/adjunct distinction in wh-in-situ languages is predicated upon the Subjacency analysis of Chomsky (1973). Huang (1982a) proposed that wh-words in wh-in-situ languages do in fact undergo a type of wh-movement, but instead of being *overt* as is the case with wh-movement languages, the wh-movement in wh-in-situ languages is *covert*. Huang further proposed restricting the Subjacency condition to *overt* wh-movement (as a condition on S-Structure).[7] In this way, the covert wh-movement in wh-in-situ languages would be constrained by Subjacency, correctly accounting for the absence of island effects with wh-arguments in wh-in-situ languages. In order to account for the presence of island effects with wh-adjuncts in wh-in-situ languages, Huang proposed that the Empty Category Principle, which stated that every empty category (such as the trace hypothesized to exist in the gap position

[7] This relies on the definition of movement as an operation holding between an antecedent and a phonetically null trace; see Chomsky (1977).

of wh-movement) must be *properly governed*, holds for traces of both overt and covert wh-movement (as a condition on LF). Huang then defined two ways in which a trace can be properly governed: (i) wh-argument traces are properly governed by virtue of being theta-marked (i.e., assigned a thematic role) by a predicate (called *head government*), and (ii) wh-adjunct traces, which are not theta-marked, can be properly governed by residing in the correct configurational relationship with the displaced wh-adjunct (called *antecedent government*). By defining the configurational relationship of antecedent government properly, the island effects observed with in-situ wh-adjuncts could be captured as a violation of the Empty Category Principle.

The ECP approach to the pattern of island effects in wh-in-situ languages, though empirically adequate, required two assumptions that could be viewed as introducing redundancy into the theory. First, the role of the Subjacency Condition was conditioned upon the type of wh-movement (overt or covert), suggesting that there were in fact two different movement operations that applied to the same types of elements (wh-words), only at different points in the syntactic derivation. Second, the structural definitions for antecedent government under the ECP were identical to the structural definitions of island effects under the Subjacency Condition, suggesting that there were two syntactic constraints (Subjacency and the ECP) with the same content. These redundancies led several syntacticians to propose alternative analyses of wh-in-situ island effects. For example, Nishigauchi (1990) proposed an analysis in which Subjacency constrains both overt and covert movement, thus capturing the existence of island effects for in-situ wh-adjuncts in the same way as wh-movement in English. In order to account for the absence of island effects for in-situ wh-arguments, Nishigauchi proposed a covert pied-piping operation in which the entire island structure moved to spec, CP rather than just the wh-word. Because the wh-word never crossed the island boundary, Subjacency was not violated. Tsai (1994) and Hagstrom (1998) took a different tack altogether, rejecting the idea that in-situ wh-words move covertly, and instead focusing on the relationship between the question particle that appears in C in languages such as Japanese and Sinhala and the in-situ wh-word. Although no consensus was ever reached about the correct analysis of the argument/adjunct distinction in wh-in-situ languages, it is clear from these proposals that accounting for these facts is no easy task, and should be a high priority for any comprehensive theory of island effects.

2.3 Resumptive pronouns

Although most of the languages discussed so far exclusively employ gap positions as the foot of long-distance dependencies, about half of the world's languages appear to allow a second option: resumptive pronouns. Resumptive

pronouns are lexically indistinguishable from regular pronouns, but appear in the position that under other circumstances would be the gap position of a long-distance dependency (McCloskey 2006). When it comes to the interaction of resumptive pronouns and island effects, McCloskey (2006) identifies three types of languages.

Type 1: Free-variation languages

In the first type of language, exemplified here by Irish (McCloskey 1990, 2006), resumptive pronouns are essentially in free variation with gaps, as long as the gap/pronoun appears outside of an island structure:

(8) a. an ghirseach a ghoid na síogaí __
the girl C stole the fairies
'the girl who the fairies stole'
b. an ghirseach ar ghoid na síogaí í
the girl C stole the fairies her
'the girl who the fairies stole'

Inside of island structures, gaps and resumptive pronouns are in complementary distribution: gaps cannot appear inside of island structures, but resumptive pronouns can:

(9) a. teach nach n-aithneochthá cá rabh sé
house neg recognize where was it
'A house that you wouldn't recognize where it was'
b. *teach nach n-aithneochthá cá rabh __
house neg recognize where was __
'A house that you wouldn't recognize where __ was'

The relevance of resumptive pronouns in free-variation languages for the theory of island effects rests in their dual nature (which McCloskey (2006) describes as Janus-like): whereas true gaps are canonically associated with long-distance dependencies that are sensitive to island effects, and true pronouns are canonically associated with a type of long-distance dependency that is not sensitive to island effects (i.e., binding relations), resumptive pronouns fall in between by allowing non-binding long-distance dependencies to cross island structures.[8]

Type 2: Restricted distribution languages

In the second type of language, exemplified here by Vata (a Kru language of North Africa: Koopman 1984, Koopman and Sportiche 1986), resumptive pronouns and gaps do not freely vary outside of island structures. For example,

[8] It should be noted that the relevance of resumptive pronouns to island effects was first observed by Ross (1967). He noted that resumptive pronouns obviate island effects when present. As he also assumed that they are related to their antecedents via movement, he concluded that movement per se could not be island-sensitive. The approach discussed by McCloskey (2006) inverts this logic: binding is different from movement and the latter is island-sensitive while the former is not. Importantly both point to a conclusion of current interest: that overt gaps make a difference even if the dependency looks similar. The problem is not the dependency but how it is formed.

in Vata, resumptive pronouns only appear in subject positions, whereas gaps only appear in non-subject positions:

(10) a. àlÓ Ò nÙ mÍ la [resumption]
Who he did it WH
'Who did it?'

b. *àlÓ __ nÙ mÍ la [gap]
Who __ did it WH
'Who did it?'

(11) a. *yI Kòfí nÙ mÍ la [resumption]
what Kofi did it WH
'What did Kofi do?'

b. yI Kòfí nÙ __ la [gap]
what Kofi did WH
'What did Kofi do?'

The pattern of island effects in languages like Vata are very interesting. On the one hand, gaps in Vata are unacceptable within Relative Clause islands (12a), but are acceptable within WH-islands (12b), suggesting a pattern of island effects similar to Romance languages (cf. Rizzi 1982b):

(12) a. yI n gugu na Kòfí yÉ yO-O mOmO à nyE-bO$_{__yO\text{-}O__yI}$
what you think NA Kofi saw child HIM we gave-REL$_{__child__what}$
yé la
PART WH
'What do you think that Kofi saw the child who we gave __?'

b. àlÓ n nI zE à nyE-bO$_{__àlÓ__zE}$ yì la
who you neg what we gave-REL$_{__who__what}$ know WH
'To whom don't you know what we have given?'

On the other hand, resumptive pronouns cause unacceptability in WH-islands (we cannot find data for resumption and Relative Clause islands, but assume that they are also unacceptable because they were not reported):

(13) *àlÓ n nI zE mEmE gbU Ò di-bO mÉ yì la
who you neg why it-it for he cut-REL it know WH
'Who don't you know why he cut it?'

These facts suggest two additional complexities for the theory of island effects: (i) some resumptive pronouns do indeed participate in island effects, and (ii) languages with resumptive pronouns can have distinct patterns of island effects for gaps and resumptive pronouns.[9]

[9] Another possibility is that the unacceptability of resumption in islands is not due to an island effect, but rather is a consequence of the restriction of resumptive pronouns to subject positions. The unacceptability could be a type of COMP-resumption effect that is similar to the well-known COMP-trace effect. The test for this possibility would be island structures that have an empty COMP position, which may not exist in Vata.

Type 3: Intrusive pronoun languages

In the third type of language, exemplified by English, resumptive pronouns are not a grammatical option (14a versus 14b). However, native speakers tend to spontaneously produce resumptive pronouns inside of island structures as in (15a), apparently in an attempt to avoid the island effects that arise when gaps appear inside island structures (15b).[10]

(14) a. That's the donkey that __ is from Brazil.
b. *That's the donkey that it is from Brazil.

(15) a. *That's the donkey that I don't know where __ is from.
b. ?That's the donkey that I don't know where it is from.

Sells (1984) suggests that the English-type resumptive pronouns be called *intrusive pronouns* to distinguish them from the resumptive pronouns that appear in languages that allow resumption as a grammatical option. This, of course, raises the question of whether resumption is a unitary phenomenon, or whether there are in fact two, or even three, distinct types of resumptive pronouns in the languages of the world (see McCloskey 2006 for a discussion).

One popular approach to the resumption facts above within the syntactic literature is to assume two types of dependency formation operations: movement and base-generation. Languages of type 1 (free-variation languages such as Irish) demonstrate both types of operations: gaps appear as the result of movement, and resumptive pronouns appear as the result of base generation. Under the assumption that movement is constrained by something like Subjacency, this analysis captures the fact that island effects arise with gaps, but not with resumptive pronouns, in these languages. Under this analysis, languages of type 2 (restricted distribution languages such as Vata) appear to demonstrate only the movement operation, with both gaps and resumptive pronouns serving as the foot of a movement dependency, and thus both demonstrating island effects. Finally, languages of type 3 (intrusive languages such as English), appear to have movement as the only grammatical option (resulting in gaps and island effects), but allow base-generation of resumptive pronouns as a type of island amelioration in production. While this type of analysis is able to capture most of the island facts above, it leaves open several serious theoretical questions such as (i) Why are gaps only the result of movement when resumptive pronouns can be the result of either movement or base-generation (i.e., why can't gaps be base-generated)? (ii) If languages of type 3 can use base-generation of

[10] Ferreira and Swets (2005) were able to recreate this type of production behavior in a laboratory. With respect to acceptability judgments, professional linguists have long reported resumptive pronouns within island structures in English to be more acceptable than gaps within island structures (e.g., Ross 1967, 1969, Sells 1984); however, non-linguist participants have given mixed results: McDaniel and Cowart (1999) and Frazier and Clifton (2002) corroborated linguists' judgments, Alexopoulou and Keller (2007) and Heestand *et al*. (2011) failed to do so.

resumptive pronouns as an extra-grammatical amelioration strategy, why are languages of type 2 restricted to the movement type of resumptive pronouns in island structures? (iii) Why do languages of type 3 use resumption to ameliorate island effects rather than some other strategy (e.g., an in-situ copy of the wh-word)?

While there are several unanswered questions raised by the syntactic approach to resumption outlined above, there is also interesting evidence to support the movement/base-generation analysis. Aoun *et al.* (2001) observe that Lebanese Arabic appears to be a type 1 language, with resumptive pronouns appearing both inside and outside of island structures. Based on the assumption that reconstruction effects (the interpretation of an element in a syntactic position other than its surface syntactic position) are due to movement, Aoun *et al.* argue that some resumptive pronouns in Lebanese Arabic are in fact the result of movement (because they show reconstruction effects), whereas other resumptive pronouns in Lebanese Arabic are the result of base-generation (because they do not show reconstruction effects). Interestingly, resumptive pronouns within island structures do not show reconstruction effects (suggesting that they are base-generated), and resumptive pronouns outside of island structures do show reconstruction effects (suggesting that they are the result of movement). Whether movement/base-generation analysis of resumption withstands future testing is an open question. Nonetheless, these facts make it clear that any comprehensive theory of island effects must interact with a diverse array of facts concerning resumptive pronouns in the languages of the world.

2.4 Parasitic gaps

Parasitic gap constructions are long-distance dependencies in which the displaced element is associated with two gap positions: one gap position occurs in a licit gap location (i.e., not inside an island structure) while the other gap position occurs inside an island structure (Engdahl 1983). Whereas a single gap within an island structure results in unacceptability (16a and 17a), the addition of another gap outside of the island structure seems to make the sentence acceptable (16b and 17b):

(16) a. *Which book did you laugh [before reading __]?
b. Which book did you judge $\_\__{\text{true}}$ [before reading $\_\__{\text{parasitic}}$]?

(17) a. *What did [the attempt to repair __] ultimately damage the car?
b. What did [the attempt to repair $\_\__{\text{parasitic}}$] ultimately damage $\_\__{\text{true}}$?

The two gaps in a parasitic gap construction are often described as the *true gap*, which occurs outside of the island, and the *parasitic gap*, which occurs inside of the island. The name is a metaphorical reference to the fact that the

parasitic gap could not exist without the *true gap*, much like a parasite cannot exist without a host.

The nature of the licensing restrictions on parasitic gaps is an active area of research, and as such a complete review is beyond the scope of this chapter (see Culicover and Postal 2001 for a collection of papers dedicated to parasitic gaps). However, Culicover (2001) lays out several properties that any theory of parasitic gaps must accommodate, and therefore any theory of island effects must accommodate, three of which we will review here.

Property 1: Parasitic gaps are licensed by long-distance dependencies such as wh-movement and relative clause formation, but not passive or raising dependencies

In parasitic gap constructions, the true gap must be the result of a long-distance dependency such as wh-movement or relative clause formation (16a), a class often described as A-bar dependencies in the syntax literature (to indicate that the displaced element appears in a non-argument position). Parasitic gaps cannot be licensed by the gaps in passive and raising constructions, that is, the class often described as A-dependencies (to indicate that the displaced element appears in an argument position) (18):

(18) a. *John was killed $\_\__{\text{true}}$ by a tree falling on $\_\__{\text{parasitic}}$.
b. *Mary seemed $\_\__{\text{true}}$ to disapprove of John's talking to $\_\__{\text{parasitic}}$.

This restriction suggests that parasitic gaps are constrained either by the position of the displaced element (A versus A-bar) or the syntactic operation that forms the dependency (if one assumes distinct types of movement operations).

Property 2: Parasitic gaps are licensed by overt wh-movement, but not wh-in-situ

Under the assumption that wh-in-situ involves a covert movement operation, one could ask whether the gap left by covert movement (which is not seen in the surface form) can license parasitic gaps the same way that overt true gaps can:

(19) a. Which articles did you file $\_\__{\text{true}}$ without reading $\_\__{\text{parasitic}}$?
b. *I forgot who filed which articles without reading $\_\__{\text{which articles}}$.

As (19b) illustrates, wh-in-situ cannot license parasitic gaps. This means that insofar as one assumes the existence of a covert movement operation (e.g., Huang 1982a), both parasitic gaps and standard island effects suggest a fundamental distinction between overt movement and covert movement.

Property 3: The true gap cannot c-command the parasitic gap

Although there appears to be no restriction on the linear order of the two types of gaps (compare 16b and 17b above), there is a structural restriction: the true gap cannot c-command the parasitic gap. In most scenarios this restriction

surfaces as a prohibition against true gaps in subject position (Engdahl 1983, repeated in Culicover 2001):

(20) a. *Which articles $\_\__{true}$ got filed by John without him reading $\_\__{parasitic}$?
b. *Who $\_\__{true}$ sent an invitation without a picture of $\_\__{parasitic}$?

However, Engdahl (1983) observes that subject positions can host true gaps as long as they do not c-command the parasitic gap:

(21) a. Who did Brutus imply $\_\__{true}$ was no good while ostensibly praising $\_\__{parasitic}$?
b. Who did you say the criticism of $\_\__{parasitic}$ would make us think $\_\__{true}$ was stupid?

One possible explanation for this restriction is based upon Condition C of the binding theory, which basically holds that certain elements cannot be bound by (therefore corefer with) a c-commanding element in the same sentence (Chomsky 1981). If one assumes that parasitic gaps are the types of elements that must respect Condition C, and that true gaps bind parasitic gaps in licit parasitic gap constructions, then the prohibition against c-commanding true gaps can be reduced to a violation of Condition C. One of the interesting consequences of this analysis is that it sets up a strong parallelism between standard gaps in non-parasitic-gap constructions and parasitic gaps, as both can be analyzed as the type of element that must respect Condition C. For parasitic gaps this surfaces as the c-command restriction on true gaps; for standard gaps this surfaces as the Strong Crossover effect (Wasow 1972), in which displaced wh-words cannot corefer with pronouns that c-command their gap positions.

Although each of these properties of parasitic gaps receives an impressive amount of empirical support in the syntactic literature, there are also quite a few counterexamples to each property (see Culicover 2001 for a review). Each property (and counterexample) provides both an interesting question that could be addressed with experimental syntax techniques, and an interesting challenge for any comprehensive theory of island effects.

3 The goals of this volume

As mentioned in section 1, the fundamental goal of this volume is to provide a forum for researchers to present experimental work that touches upon one of the longest-standing issues in linguistic theory, the source of island effects. Given the brief review of island phenomena in the previous sections, we are also in a position to elaborate a secondary goal, which is to construct a comprehensive theory of island effects. Such a theory would ideally capture the following sets of facts:

(i) The (potentially constrained) variation observed in Romance and Scandinavian languages with respect to types of island effects;
(ii) The patterns of island effects observed in wh-in-situ languages such as Chinese, Japanese, and Sinhala;
(iii) The interaction of resumptive pronouns with island effects in Irish-type, Vata-type, and English-type languages;
(iv) The existence of parasitic gaps that can (grammatically) appear inside of island structures, as well as the restrictions on their appearance.

In the discussions above we have already seen some of the ways in which syntactic theories have attempted to capture all of these facts with a minimal set of syntactic operations and constraints (Subjacency, the ECP, parameterized bounding nodes, movement, base-generation, and Condition C). Our hope is that the studies presented in this volume will point the way toward similarly comprehensive theories, either through a wholesale re-evaluation of the empirical support for these patterns, or by bringing new data types to bear on these questions to help elucidate the cognitive mechanisms underlying them. In short, we hope this volume will push the boundaries of language research by leveraging experimental syntax techniques, and in the process demonstrate the utility of experimental techniques to (i) address long-standing issues in syntax such as the source of island effects, (ii) broaden the empirical and theoretical reach of linguistic theories.

The rest of this volume is organized in two parts. Part 1 presents chapters that deal with global issues in investigating the source of island effects. In chapter 2, Sprouse, Wagers, and Phillips present a factorial definition of island effects that can serve as a starting point for the studies in this volume, as it can be used to tease apart competing predictions between grammatical and reductionist (also known as "processing") approaches to island effects (which they demonstrate by combining acceptability judgments and working memory tasks). In chapter 3, Hofmeister, Staum Casasanto, and Sag present a series of arguments against a grammatical approach to island effects, and in favor of a reductionist approach, drawing on data from acceptability judgments, reaction times, and working memory tasks. In chapter 4, Phillips discusses the range of facts, both in terms of acceptability judgments and real-time processing measures such as reaction times and ERPs, that a theory of island effects must account for, and delineates two lists of empirical challenges: one for reductionist accounts, and one for grammatical accounts. In chapter 5, Pearl and Sprouse address one of the motivations for the debate between grammatical and reductionist accounts: the claim that a grammatical approach to island effects necessitates innate linguistic constraints (i.e., Universal Grammar). Contrary to this claim, Pearl and Sprouse propose (and implement) a computational model that can learn island effects as a type of grammatical constraint from a corpus of child-directed speech without resorting to innate linguistic biases (i.e., UG). In chapter 6, Phillips

further discusses the potential learning problem raised by island effects, as this is one of the challenges on his list for grammatical approaches in chapter 4, by presenting a series of challenges to the Pearl and Sprouse (chapter 5) model of island effect acquisition.

Part 2 of this volume presents chapters that investigate more specific issues in the analysis of island effects. In chapter 7, Wagers presents a detailed model of how long-distance dependencies are formed during real-time processing, with a specific focus on the role of working memory, as working memory has been a crucial component of many reductionist approaches to island effects. In chapter 8, Kluender and Gieselman use negative islands to investigate the factors that may contribute to island effects under a reductionist approach. In chapter 9, Dillon and Hornstein use the semantic minimal pair of noun-complement constructions and naked-infinitive constructions to isolate to what extent purely structural (i.e., not semantic) factors play a role in the acceptability of island effects. In chapter 10, Goldberg explores the possibility that island effects may be reducible to an information-theoretic conflict that arises when elements are extracted from backgrounded constituents. In chapter 11, Kush, Omaki, and Hornstein investigate to what extent the factors that allow extraction from relative clause islands in Swedish also ameliorate extraction from relative clause islands in English. In chapter 12, Jurka uses German to investigate variation in subject islands in an effort to tease apart analyses that specify all subjects as island domains (e.g., CED analyses) and analyses that specify displaced constituents (a class to which only some subjects belong) as island domains (e.g., freezing/subextraction analyses). In chapter 13, Polinsky, Gallo, Graff, Kravtchenko, Morgan, and Sturgeon extend this investigation of subject islands to both English and Russian using both acceptability judgments and self-paced reading tasks. In chapter 14, Alexopoulou and Keller use resumption, animacy, and d(iscourse)-linking in English and Greek to probe the nature of *whether*-islands and determine to what extent these factors may ameliorate the processing complexity associated with these islands. In chapter 15, Polinsky, Clemens, Morgan, Xiang, and Heestand further probe the nature of resumption in English using both self-paced reading and time-constrained acceptability judgment tasks in an effort to understand the conflicting results of previous resumption studies (see section 2 above). Finally, in chapter 16, Yoshida, Lee, and Dickey use the island-sensitivity of sluicing and the island-insensitivity of sprouting to investigate whether the sentence-processing system incrementally constructs syntactic structure in ellipsis constructions.