

# A syntactic answer to a pragmatic puzzle: The case of asymmetric *and*\*

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## Abstract

Asymmetric temporal or causal interpretations of natural language *and* have often been attributed to the semantics/pragmatics interface: these interpretations arising pragmatically on the basis of a symmetric semantics for *and*, traditionally regarded as equivalent to the truth-functional operator  $\wedge$ . This paper argues instead that asymmetric interpretations of *and* arise at the syntax/semantics interface. I argue that structural syntactic properties, specifically the size of the constituents coordinated (particularly in embedded contexts), directly effect the interpretations available to coordinated clauses.

## 1 Introduction

The papers in this volume address the question: *how much of grammar is syntax?* In contemporary linguistics, the answer is often: *a great deal*. Syntactic structure lies at the heart of much of what we understand about natural language.

Perhaps the best established case of this is the link between structure and meaning, at the heart of the body of successful research on the syntax-semantics

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interface, and of work in formal semantics more generally. Here, as in other domains, we can ask to what extent a particular set of facts is best explained by syntactic factors, and to what extent a purely semantic explanation would be more successful. And yet, the mere possibility of syntactic explanations for semantic phenomena has been an advantage of formal semantics over earlier, primarily philosophical, semantic work. Accounts of variable quantifier scope<sup>1</sup> in terms of covert syntactic movement, for example, have led to the discovery that inverse scope readings are often subject to the same restrictions as overt movement.

This paper illustrates this advantage by bringing syntactic evidence to bear on a puzzle that has previously been considered only at the interface between semantics and pragmatics. The puzzle concerns so-called *asymmetric* uses of the coordinator *and*, illustrated in (1). The most natural interpretation of these sentences is that the first conjunct is temporally or causally *prior* to the second conjunct.

- (1) a. The lights came on and the singer stepped onto the stage.
- b. The sniper shot him and he died.

The clauses in (1) are asymmetrically coordinated in that their temporal/causal interpretations do not persist when the two clauses are reversed, as in (2):

- (2) a. The singer stepped onto the stage and the lights came on. ( $\neq$  (2-a))
- b. He died and the sniper shot him. ( $\neq$  (2-b))

This asymmetric use of *and* is striking because it diverges sharply from fundamentally

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<sup>1</sup>For example, variable scope can be found between subjects and objects in languages like English. In a sentence such as *someone loves everyone*, either the subject or object can take wide scope.

symmetric truth-functional connective  $\wedge$ , which does allow the clauses it coordinates to be reversed. Considering sentences such as those in (3), classical logic and modern formal semantics both widely assume that  $\wedge$  is the default or natural interpretation of natural language *and*.

- (3) a. Water freezes at 0°C, and London is the capital of England.  
b. London is the capital of England and water freezes at 0°C. (= (3-a))

The existence of asymmetric uses of *and* therefore present a puzzle and a stumbling block for any unified semantic treatment of *and*. It has generally been argued that the logical interpretation of *and* is semantically basic, and that asymmetric interpretations arise from general rules of pragmatic inference (Grice, 1975; Schmerling, 1975; Posner, 1980; Carston, 1993, 2002), though a minority have argued that asymmetric interpretations are basic and logical ones derived (Bar Lev and Palacas, 1980; Txurruka, 2003).

Despite considerable disagreement among these analyses, they are united in assuming that the solution lies somewhere at the interface of semantics and pragmatics. This paper approaches the puzzle from a very different perspective, arguing that its solution lies in the interaction of syntax and semantics.

More specifically, I show that the difference between symmetric and asymmetric interpretations for clausal coordination can be traced to the syntactic size of the constituents being coordinated.<sup>2</sup> This contrast is masked when matrix clauses are

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<sup>2</sup>A connection between the size of conjoined constituents and asymmetric interpretations is not an entirely new idea. Such a connection is suggested by Posner (1980) for English, and has been advanced for asymmetric coordination constructions in German by a number of authors (the German facts are discussed briefly in 3.2). This has expressed the intuition that smaller coordinated constituents result in a greater de-

coordinated, but revealed in embedded contexts, where smaller clausal constituents (TPs) visibly contrast with larger ones (CPs). It is only when smaller clausal constituents are coordinated that asymmetric readings emerge, while symmetric or logical interpretations are limited to coordinations of larger constituents.

I argue that these generalizations extend to matrix coordination, which is structurally ambiguous between TP and CP coordination. Incorporating this ambiguity into the analysis of asymmetric *and* also opens the door to a wider unification, including VP coordination and conditional interpretations of clausal *and*. More broadly, I argue that the assumption that natural language will mirror properties of classical logic – specifically, that *and* has the semantics of  $\wedge$  – has obscured a broader pattern in the use of *and* to coordinate clauses and sub-clausal elements.

## 2 Asymmetric coordination: the facts

This section begins by providing a more thorough overview of the asymmetric interpretations available to *and*, and briefly outlines the pragmatic accounts of it that have been proposed. In what follows, I use *asymmetric and* and *logical and* as labels for instances of *and* occurring in sentences with asymmetric and symmetric interpretations, respectively. This is for convenience only, and should not be understood as presupposing the existence of multiple lexical entries for *and*.

A range of temporal and causal interpretations are available to sequences of

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gree of semantic integration between two clauses. As far as I know, however, the details of this proposal, and its implications for the formal semantic analysis of coordination more generally, have not previously been developed.

clauses coordinated by *and*, some of which are illustrated in (4).

- (4) a. The lights came on and the singer stepped onto the stage.
- b. The sniper shot him and he died.
- c. The dam broke and the valley flooded.
- d. We spent the day in town and I went to Harrods.<sup>3</sup>
- e. The lights were off and I couldn't see.<sup>4</sup>

Notably, not all of these involve a sequence of events (Schmerling, 1975): in both (d) and (e) in (4), the first clause can be seen as setting a *background* against which the second clause occurs.

The early literature on asymmetric *and* adopted a very straightforward pragmatic account of these interpretations, proposing that they arise from a Gricean maxim of orderliness, requiring that (all else being equal) one describe situations in the same order they occur (Grice, 1975; Schmerling, 1975). Posner (1980) noted explicitly that the same temporal and causal interpretations seen in (4) are available to sentences that are not syntactically connected, but merely sequenced or juxtaposed, as we see in (5).

- (5) a. The lights came on; the singer stepped onto the stage.
- b. The sniper shot him; he died.
- c. The dam broke; the valley flooded.
- d. We spent the day in town; I went to Harrods.
- e. The lights were off; I couldn't see.

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<sup>3</sup>Example originally from Carston (1993).

<sup>4</sup>Example originally from Schmerling (1975).

Because these clauses are merely juxtaposed, their asymmetric interpretations can arise only through principles of pragmatic inference. The simplest analysis, Posner argued, would thus be one in which exactly the same principles give rise to such interpretations in the case of coordination. The only justification for a separate analysis of *and* would be some difference of interpretation between coordination and clause sequencing.

Exactly such differences were brought into this discussion by Bar Lev and Palacas (1980). They observed that asymmetric *and* actually prohibits a ‘backwards’ temporal/causal relationship between its conjuncts, as we saw already in the introduction. This is further illustrated by the sentences in (6), which reverse the clause order from (4): even when the two events described would most naturally occur in a particular order, the backwards interpretations are not available.<sup>5</sup>

- (6) (cf. (4))
- a. The singer stepped onto the stage and the lights came on.
  - b. He died and the sniper shot him.
  - c. The valley flooded and the dam broke.
  - d. I went to Harrods and we spent the day in town.
  - e. I couldn’t see and the lights were off.

Sequenced clauses, however, are not subject to this restriction. The sentences in (7) do permit backwards temporal/causal interpretations, unlike their coordinated

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<sup>5</sup>The sentences in (4-d-e) conveyed a containment (or backgrounding) relationship between the first and second conjunct, rather than sequencing of the two events. It is this reading that is relevantly missing from (6-d-e): (6-d) does not naturally convey that the trip to Harrods occurred *during* the day in town, and (6-e) does not convey that my inability to see is *because* the lights are off.

counterparts in (6).

(7) (cf. (5))

- a. The singer stepped onto the stage; the lights came on.
- b. He died; the sniper shot him.
- c. The valley flooded; the dam broke.
- d. I went to Harrods; we spent the day in town.
- e. I couldn't see; the lights were off.

The crucial point is that the sentences in (7) have an interpretation unavailable to those in (6). Were pragmatic inference equally responsible for all asymmetric interpretations, we would not expect any such difference. It appears that the use of *and* to connect clauses restricts their possible interpretation relative to one another.

As Bar Lev and Palacas observe, the contrast between (6) and (7) thus argues decisively against the simple pragmatic account of asymmetric *and* articulated by Grice, Schmerling, and Posner. Bar Lev and Palacas conclude that *and*'s semantics is intrinsically asymmetric, proposing that it imposes a requirement that the second conjunct not temporally precede its second conjunct. This built-in temporal asymmetry straightforwardly accounts for the naturalness of asymmetric interpretations for *and*. What it does not allow for, however, is the existence of clear counterexamples, already noted in Bar Lev and Palacas (1980). A slightly modified version of the example they discuss appears in (8). In this sentence, a backwards temporal/causal link is explicitly stated. If *and*'s meaning explicitly prohibited such a relationship between two conjuncts, sentences such as (8) would be internally contradictory, contrary to fact.

- (8) The old king has died of a heart attack and a republic has been formed, **and the latter event has caused the former.**

More recently, sentences in which world knowledge allows an inferred backwards interpretation have been discussed, such as (9) (adapted from Carston (2002, 233, ex. 15)):

- (9) She did her PhD in the US and she did her MA in Canada.

And finally, in some cases a particular focus intonation seems to allow – perhaps to prefer – a backwards interpretation, as in (10), attributed by Carston (1993) to a personal communication from Larry Horn.

- (10) A: Did Bill break the vase?  
B: Well, the vase **BROKE**, and **HE** dropped it.

Again, the response in (10) straightforwardly conveys that the listener should conclude that it was Bill's dropping the vase that broke it, though this does not correspond to the order in which the clauses occur.

These backwards interpretations present a serious problem for a unified asymmetric semantics for *and*, just as the more general restriction to forward interpretations (seen in the contrast between (4) and (6)) presents a problem for the simplest pragmatic account.

Any analysis of asymmetric coordination must resolve the tension between these two sets of facts. In the last twenty years, several authors have aimed to do so by providing more sophisticated pragmatic accounts of *and*'s variable interpretations,

including Carston (1993), Txurruka (2003), Blakemore and Carston (2005), and Zeevat and Jasinskaja (2007), among others. These proposals have in common that they assume that coordinated clauses have pragmatically-relevant properties that clause sequences lack (whether these properties are specific to *and* itself varies between these approaches).

In attributing asymmetric readings to the pragmatic or discourse component of the grammar, these approaches have assumed that there are no semantic differences between asymmetric and logical uses of *and*. Beyond this is a more implicit assumption that there is no relevant syntactic differences between different varieties of clausal coordination.

The next section demonstrates, however, that there are in fact syntactic differences to be found between asymmetric and logical *and*. More precisely, variation between asymmetric and logical interpretations correlates with detectable differences in the size of the coordinated clauses. This opens up the possibility that the solution to the puzzle of asymmetric *and* can be found at the interface between syntax and semantics.

Though this possibility has not previously been generally pursued as part of a general analysis of clausal coordination, it fits naturally into a broader picture of coordination in natural language. Coordination of other syntactic categories is well known to vary in interpretation with the size of the constituents being coordinated, both in the nominal domain (Bergmann, 1982; Dowty, 1988; Winter, 1996, et seq.) and in sub-clausal coordination of VPs (Goldsmith, 1985; Lakoff, 1986; Postal, 1998). With such other examples in view, it should come as no surprise that the same kind of variation shows up at the clausal level.

### 3 Links between structure and interpretation in clausal coordination

#### 3.1 Structural contrasts in embedded coordination

Evidence that asymmetric and logical coordination arise from different syntactic structures comes from cases of embedded clausal coordination. Unlike matrix coordination, where there is no visible syntactic difference between asymmetric and logical *and*, in embedded contexts we find evidence that asymmetric *and* involves coordination of smaller constituents than logical *and*. This contrast is visible in (11).<sup>6</sup>

- (11) a. The newspaper reported that a new government was elected and there was a riot.
- b. The newspaper reported that a new government was elected and that there was a riot.

In (11-a) a single instance of *that* introduces the embedded coordination. The second conjunct does not include a second *that*, despite the fact that *report* is a verb that strongly prefers an overt complementizer. It therefore appears that (11-a) involves coordination of a clausal constituent that does not include the complementizer, namely TP.<sup>7</sup> In (11-b), by contrast, each coordinated clause is introduced by a separate *that*, and

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<sup>6</sup>The judgements reported in this section are the author's own, with confirmation from an informal survey of other speakers of North American varieties of English.

<sup>7</sup>Progovac (1998), citing Gazdar et al. (1985), notes a second conjunct is sometimes able to violate the subcategorization requirements of an embedding verb: e.g. *You can depend on my assistant and that he will arrive on time*. It is therefore possible that (11-a) does involve CP coordination, but that *report*'s subcategorization requirements (for a non-null complementizer) are violated by the second conjunct. This possibility would fail to explain, however, the systematic differences between pairs of sentences such as

so this example must involve the coordination of full CPs. These two structures are illustrated in (12):

- (12) a. ...report [<sub>CP</sub> that [<sub>TP</sub> ...] and [<sub>TP</sub> ...] ]  
b. ...report [<sub>CP</sub> that ...] and [<sub>CP</sub> that ...]

This syntactic difference is significant because it correlates with an interpretive difference: coordination of TPs, as in (11-a), results in an asymmetric interpretation, while coordination of CPs, as in (11-b), results in the symmetric interpretation of logical *and*. The remainder of this section demonstrates this interpretive contrast.

First let us consider a scenario in which two events are reported, but no connection holds between them. Such a scenario should be incompatible with an asymmetric interpretation for an embedded coordination. (13) presents a scenario with this profile, and the judgements of speakers for both TP and CP embedded coordinations. Interestingly, speakers judge that the sentence with embedded TP coordination is false or misleading, but that CP coordination remains fully acceptable. This strongly suggests that only TP coordination conveys the asymmetric reading for *and*.

- (13) *Scenario 1: the newspaper ran two unrelated stories yesterday. In the first it reported that the incumbent government was defeated in yesterday's election; in the second it reported on a riot that occurred in the wake of a hockey game.*
- a. #The newspaper reported that a new government was elected and there was a riot. (= TP coordination)
- b. The newspaper reported that a new government was elected and that there

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(11), which we will see throughout this section.

was a riot.

(= CP coordination)

In contrast to (13), the scenario in (14) is indeed compatible with an asymmetric interpretation of the clausal coordination – and thus necessarily also compatible with a logical interpretation for *and*, given that “*P temporally preceded or caused Q*” entails “*P ∧ Q*”. Also in contrast to (13), both TP and CP coordination are judged acceptable in this scenario. At the same time, speakers report that the TP coordination in (14-a) is a better or more informative report, in direct contrast to the judgement reported for (13), where no relationship holds between the two reported events. Again, this suggests that TP coordination conveys a more informative asymmetric reading, while CP coordination does not.

(14) *Scenario 2: An engineer said: “The dam broke. As a direct consequence of that, the valley below the dam flooded.”*

a. The engineer has confirmed that the dam broke and the valley flooded.

(= TP coordination)

b. The engineer has confirmed that the dam broke and that the valley flooded.

(= CP coordination)

Further confirmation that embedded CP coordination communicates only the symmetric relation of logical *and* can be found by comparing the sentences in (14) with those in (15). The latter simply reverse the coordinated clauses from the former. With this change, TP coordination becomes infelicitous, but CP coordination remains acceptable, despite the clauses occurring in the reverse of the sequence of events described in the scenario.

(15) *Scenario: same as (14)*

a. #The engineer has confirmed that the valley flooded and the dam broke.

(= TP coordination)

b. The engineer has confirmed that the valley flooded and that the dam broke.

(= CP coordination)

In summary, the syntactic difference between coordinated TP and CP constituents correlates with an interpretive difference between asymmetric and logical coordination. TP coordination is judged acceptable only in situations compatible with an asymmetric interpretation, while CP coordination is compatible not only with situations that involve no relationship between two situations, but also with situations that support a backwards relationship.<sup>8</sup>

It thus appears that TP coordination, at least in embedded contexts, gives rise to asymmetric *and*: it expresses a “forward” temporal or causal relationship between events, it is felicitous only in contexts that involve such event relationships, and it does not allow its conjuncts to be reversed while maintaining its interpretation.

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<sup>8</sup>There is also some evidence that this is true of embedded non-finite clauses, with the complementizer *for*:

- (16) a. The opposition planned for the vote to take place and the government to fall.  
b. The opposition planned for the vote to take place and for the government to fall.

(16-b), but not (16-a), seems to be compatible with a plan in which the government is not planned to fall as a result of the vote.

An interpretive contrast between embedded TP and CP coordination also arises beyond the domain of attitude and reportative verbs. The same contrast can be found under modals such as *necessary* and *possible*:

- (17) a. It is possible that it will rain tomorrow and we'll cancel the party.  
b. It is possible that it will rain tomorrow and that we'll cancel the party.

(17-b), but not (17-a), seems to be true if it rains tomorrow but the party is cancelled for some other reason. Thank you to an anonymous reviewer for pointing out the relevance of the modal examples.

CP coordination, by contrast, has the symmetric properties of logical *and*: it remains felicitous in any situation where both conjuncts are true, regardless of the relationship between events, and its interpretation is stable when its conjuncts are reversed, just as  $P \wedge Q$  is true whenever  $Q \wedge P$  is true.

The same paradigm of embedded coordination can be found in languages other than English; indeed, yet stronger evidence for this pattern can be found by looking at languages that require overt complementizers for all embedded finite clauses. In English any of the examples identified so far as TP coordination *could* potentially involve CP coordination (with the second complementizer being silent), but this is not possible in languages with no silent complementizer.

One such language is Modern Greek which, as we see in (18), requires the complementizer *oti* to introduce embedded finite clauses.<sup>9</sup>

- (18) Ksero    \*(oti) i    Maria ton apelise  
      know.1SG COMP DET Maria him fired.  
      “I know (that) Maria fired him.”

Like English, Greek matrix coordination allows both logical and asymmetric interpretations. In embedded contexts, however, the visible difference between TP and CP coordination appears to resolve this ambiguity. The examples in (19-a) and (19-b) differ in whether they involve TP coordination (one complementizer) or CP coordination (two complementizers). As in English, this structural variability correlates with an interpretive difference: TP coordination results in a strong causal reading, whereas CP coordination does not.

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<sup>9</sup>Greek data are from Sabine Iatridou (p.c.).

- (19) a. Ksero oti o Yanis skondapse ke i Maria ton apelise  
 know.1SG COMP DET Yanis tripped.3SG and DET Maria him fired.  
 “I know that Yanis tripped and Maria fired him.” (... from the dance troupe)
- b. Ksero oti o Yanis skondapse ke oti i Maria ton apelise  
 know.1SG COMP DET Yanis tripped.3SG and COMP DET Maria him fired.  
 “I know that Yanis tripped and that Maria fired him.” (... but the two aren’t  
 necessarily related)

Embedded coordination in Dutch shows the same pattern. Again, embedded TP coordination (as in (20-a)) has an asymmetric interpretation, while embedded CP coordination (as in (20-b)) has only a symmetric/logical interpretation:<sup>10</sup>

- (20) The newspaper reported...
- a. **dat** [ de minister een nieuwe burgemeester benoemd had ] en [ er rellen  
 that the minister a new mayor appointed had and there riots  
 waren. ]  
 were  
 “... that the minister appointed a new mayor and there were riots.”
- b. [ **dat** de minister een nieuwe burgermeester benoemd had ] en [ **dat**  
 that the minister a new mayor appointed had and that  
 er rellen waren. ]  
 there riots were  
 “... that the minister appointed a new mayor and that there were riots.”

It thus appears that the structural correlates of the interpretive contrast between asymmetric and logical *and* are not simply a curious property of English, but are instead stable across several languages.

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<sup>10</sup>Dutch data are from Erik Schoorlemmer (p.c.). Like English, Dutch allows both symmetric and asymmetric interpretations for matrix coordination of sentences – the interaction of this with Dutch’s status as a V2 language is discussed below.

### 3.2 Structural contrasts in matrix coordination

The previous section having having established a correlation between structure and the interpretation of *and* in embedded contexts, it remains to be asked whether this correlation extends to matrix coordination, where the puzzle of asymmetric *and* originally arose.

In languages like English it is not transparent whether matrix coordinated clauses are TP or CP constituents. This ambiguity of structure, however, mirrors the ambiguity in matrix coordination's interpretation. Sentences like those in (21), repeated from (4), are ambiguous between their prominent asymmetric interpretations, discussed in section 2, and the symmetric interpretation of logical *and*.

- (21) a. The lights came on and the singer stepped onto the stage.  
b. The sniper shot him and he died.  
c. The dam broke and the valley flooded.

Pursuing an analogy to the cases of embedded coordination, I propose that matrix coordination involves a systematic case of *structural ambiguity*, in which (non-visible) variation between TP and CP coordination results in correlated interpretive variation between asymmetric and logical *and*.

If this is the case, then the interpretation of *and* should be able to be manipulated in ways that parallel known cases of structural ambiguity. I argue that the cases of exceptional backwards interpretations for *and* discussed in section 2 can be understood in precisely this way. These are cases in which some other consideration – an explicit statement, world knowledge, or other factors governing syntactic structure – favours a

syntactic parse of CP coordination. One this happens, the symmetric logical interpretation available to CP coordination can be augmented by a pragmatically inferred backwards temporal relationship, one that would be unavailable for TP coordination.

To illustrate this proposal, consider once again the sentence in (22), in which a subsequent clause overtly asserts the existence of a backwards causal relationship between earlier coordinated clauses (repeated from (8)):

- (22) The old king has died of a heart attack and a republic has been formed, and the latter event has caused the former.

This cancellability has been taken as evidence that asymmetric readings of *and* arise from pragmatic reasoning – it is a hallmark of implicatures that they are cancellable by subsequent assertion. An alternative, however, is that the canceling clause in (22) (“and the latter event has caused the former”) resolves the structural ambiguity of the coordination, forcing it to be understood as CP coordination, expressing no temporal connection between the conjuncts. This would render (22) parallel to a classic case of structural ambiguity such as (23), in which the continuation in parentheses resolves the syntactic status of the ambiguous adjunct *with a telescope*.

- (23) I saw a man with a telescope (. . . though he was close enough to see with the naked eye).

Essentially the same explanation can be applied to cases in which it is world knowledge that favours a reverse temporal relationship, such as (24), repeated from (9).

- (24) She did her PhD in the US and she did her MA in Canada.

If clausal coordination is structurally ambiguous, (24) can be understood as a case in which world knowledge influences the resolution of the ambiguity in favour of logical/symmetric *and*– just as world knowledge influences the syntactic parse of a sentence like (25):

(25) I saw a man with a teapot.

(25) is in principle ambiguous, but our knowledge about teapots and seeing strongly influences a particular parse of the clause-final adjunct.<sup>11</sup>

Finally, some syntactic contexts will require even matrix *and* to be parsed as CP coordination. I argue that the backwards interpretations conveyed by focus, repeated in (28) from (10), should be understood in this way.

(28) A: Did Bill break the vase?

B: Well, the vase **BROKE**, and **HE** dropped it.

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<sup>11</sup>On the analysis proposed in this paper, the direction in which these resolutions occur – towards logical interpretations for *and* from asymmetric ones – suggests that there is a preference to parse clausal coordination as coordination of smaller constituents (TPs) rather than larger ones (CPs), in the absence of other determining factors. This is supported by the following contrast, pointed out by an anonymous reviewer:

(26) The old king has died of a heart attack and a republic has been formed.

- a. But the second event happened before the first one.
- b. #But the first event happened before the second one.

This raises the question of whether there is a general preference for coordination of smaller constituents. It is relevant to observe in this context that VP coordination is often preferred to clausal coordination when two clauses share the same subject: while (27-a) is in no way ungrammatical, (27-b) appears to be somewhat preferable.

- (27) a. (?) The students read the book and they had many questions about it.  
b. The students read the book and had many questions about it.

The contrast in (27) could be explained by a general preference for smaller conjuncts over larger ones, but more research would be necessary to confirm this point.

Significantly, this class of counterexamples requires separate focus in each of the coordinated clauses. Given the proposal that focus involves a relationship between the focused element and a projection in the left periphery (as in, for example, the articulated CP of Rizzi 1997), the appearance of two separate focuses reasonably requires that each conjunct project its own CP layer – and thus the logical symmetric interpretation of CP coordination. Listeners are free to draw reverse temporal/causal inferences on the basis of logical *and*, because it does not convey any such relation on its own – and indeed, the reverse interpretation in (28) has been reported to be *less-direct* than the forward interpretation usually available to coordination (Carston, 2002, among others).

Supporting this view is the fact that world knowledge or context can allow us to infer the same reverse relationship for embedded CP coordination, in (29-b), that we find for matrix coordination with focus, as in (29-a):

- (29) a. WELL, the millionaire DIED, and the butler gave him POISON.  
b. We know that the millionaire died and that the butler gave him poison.  
... and so we can conclude that the butler intentionally murdered him.

Rather than being problematic for the account of asymmetric *and* proposed in this paper, as they have been for past accounts, these cases of backwards interpretations for *and* are fully compatible with the view that matrix coordination is structurally ambiguous between TP coordination (asymmetric) and CP coordination (symmetric). The focus-based reverse interpretations, moreover, provide more positive evidence for this position, with the assumption that focus requires an associated left-peripheral projection.

We might expect to find yet stronger evidence for this conclusion in languages

where there is wider evidence for a distinction between TP and CP constituents in matrix contexts. Verb-second word order in Germanic languages is generally argued to involve the CP layer of the clause, and so coordination of two V2 clauses should necessarily involve coordination of CPs. On the present account we would therefore predict that coordination of matrix clauses in Germanic languages would always have logical (non-asymmetric) interpretations.

This prediction, however, is not borne out. Dutch, for example, allows both logical and asymmetric interpretations when V2 clauses are coordinated (Erik Schoorlemmer, p.c.):

- (30) De sluipschutter schoot hem neer en hij stierf.  
The sniper shot him down and he died.  
“The sniper shot him and he died (because he was shot OR independently).”

This kind of example clearly presents a challenge for the simple structural account articulated so far in this paper, particularly if the finite verb in a V2 clause occupies exactly the same position as an embedding complementizer.

Despite this challenge, however, there is another source of evidence that the interpretation of clausal coordination is structure dependent. This evidence comes from what has been called the SGF (*Subject Gap in Finite/Fronted*) construction (Höhle, 1983, 1990), found in German, Dutch, and some other V2 Germanic languages.

In this construction, a non-subject argument is fronted within the first of two coordinated matrix clauses, resulting in a post-verbal subject. The second clause is verb-initial, but contains a subject gap. The two clauses appear to share the same subject, though that subject is contained within the first conjunct and has not ATB-extracted. (31)

provides an example from German:<sup>12</sup>

- (32) In den Wald ging der Jäger und fing einen Hasen.  
in the wood went the hunter and caught a hare  
“The hunter went into the woods and caught a hare.”

What is especially striking about this construction, in light of the embedding facts discussed in the previous section, is that it has only asymmetric interpretations (Höhle, 1983, cited in Höhle, 1990; Reich, 2009). It has been argued that SGF constructions involve a constituent slightly smaller than a full CP – perhaps C’ (Höhle, 1990; Heycock and Kroch, 1994). SGF coordinations thus provide evidence internal to languages like Dutch and German that not only the syntax but also the interpretation of clausal coordination is crucially dependent on the size of the constituents coordinated.

The puzzle does nonetheless remain of why the coordination of full V2 clauses in these languages is not restricted to symmetric logical interpretations of *and*. A possibility worth investigating is that merely distinguishing TP and CP coordination oversimplifies the structural contrasts relevant for coordination’s interpretation. It may be instead that embedded clauses introduced by a complementizer differ in size, or some other relevant property, from matrix V2-clauses. Pursuing this possibility would require a more thorough investigation of the interaction of V2 and coordination than is possible here, however.

At his point it is worthwhile to discuss a final alternative to the view, assumed

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<sup>12</sup>English, despite no longer being V2, preserves an example of this construction in the nursery rhyme *The Itsy-Bitsy Spider*, as in (31):

- (31) [Down came the **the rain**] and [ *t* washed the spider out].

Thank you to David Pesetsky for pointing this example out to me.

throughout this section, that the symmetric interpretations of embedded CP coordination and matrix logical *and* are the same, or at least relevantly parallel. Another possibility is that the symmetric interpretation of embedded CP coordination is subtly different from ordinary logical *and*.

Most significantly, embedded CP coordination differs from its matrix counterpart in the presence of the embedding verb itself. We might wonder whether it is the interaction of this verb with multiple complementizers that gives rise to apparently symmetric interpretations. In cases of embedded disjunction with *or*, for example, the natural interpretation of disjoined CPs is one of multiple possible speech acts (rather than propositions).<sup>13</sup>

- (33) The newspaper reported that a new government was elected or that there was a riot.<sup>14</sup>

It is certainly the case that (33) communicates that one of two possible reporting events took place, rather than that a disjunction itself was reported. Similar interpretations are possible with embedded CP coordination, though less unambiguously than in the case of disjunction. Such interpretations suggest that symmetric interpretations might arise from the independence of two reported speech acts: if embedded CP coordination associates each proposition with an independent speech act, then there would be no assertion that the propositions themselves were linked.

CP coordination does not *require* the existence of multiple speech acts, however,

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<sup>13</sup>This possibility and the relevance of embedded disjunctions were independently suggested to me by Danny Fox and by Hazel Pearson.

<sup>14</sup>Note that the second *that* here is obligatory: TP disjunction does not appear to be possible in this example.

as illustrated by (34). Association with separate speech acts thus cannot provide a complete explanation for the symmetric interpretations available to such sentences – there is no necessary causal or temporal connection between the conjoined clauses in (34).

- (34) In a single breath, my friend told me that she was moving to the West coast and that her computer had been acting up.

Distinguishing embedded CP coordination from matrix logical *and* also multiplies, rather than simplifies, the puzzles concerning *and*'s interpretation. This distinction would still provide no explanation of why embedded *TP* coordination should be restricted to asymmetric readings: this restriction cannot be accounted for in terms of speech acts, as embedded *TP* coordination can be used to communicate temporal or causal connections originally made across multiple speech acts in a discourse.

It is worth noting more generally, moreover, that we should be cautious when extending to *and* conclusions drawn from the behaviour of *or*. Though these two connectives are often considered to be parallel to one another, *or* shows much more restricted behaviour in asymmetric contexts. *Or* lacks asymmetric readings at the VP level altogether (Postal, 1998), and its asymmetric readings at the clausal level are much more restricted than *and*'s (Culicover and Jackendoff, 1997), appearing only in some tense/mood contexts (future-oriented and imperatives), and not allowing non-ATB extractions that are possible with conditionally-interpreted clausal coordination.

Should a distinction between matrix and embedded coordination prove motivated, however, the more general point of this paper remains: that structural factors play an important role in accounting for the various interpretations of clausal coordination that

we do in fact find. In the next section I discuss how this kind of syntactically-motivated approach fits in not only with what we know about coordination, but what we know about the connection between natural language and classical logic more generally. This lends further support to the view that an analysis of *and*'s variability is to be found, at least in part, in the syntax, rather than in the interaction of semantics and pragmatics, as previously assumed.

## 4 Discussion

Section 3 has argued that syntax plays a role in determining the interpretation of clausal coordination, with smaller clausal constituents giving rise to asymmetric interpretations while larger ones give rise to symmetric logical interpretations. This section turns to broader issues, discussing how a syntactic perspective on asymmetric vs. logical *and* relates not only to coordination of other categories, but also to more general questions in natural language semantics.

One of *and*'s best known properties is its ability to join constituents of many different syntactic – and semantic – types. This on its own presents a puzzle for the semantics of *and*, though one to which formal answers have long been available, beginning in the proposals of Gazdar (1980) and Partee and Rooth (1983).

These proposals, and many that followed them, have continued to view the symmetric meaning of logical  $\wedge$  as the the “normal” or “basic” meaning of *and*. If we set clausal coordination to one side, however, and focus on coordination of sub-clausal constituents (often referred to as VP-coordination, though the coordinated constituents

can often include auxiliaries and modals outside VP), we find widespread and striking asymmetric interpretations. Indeed, asymmetric interpretations are required in cases in which the Coordinate Structure Constraint appears to be violated, when extraction takes place out of only one of two coordinated VPs (Ross, 1967; Goldsmith, 1985; Lakoff, 1986). This is illustrated by the non-equivalence of the (a) and (b) examples in (35) and (36).

- (35) a. What did Alice [go to the store] and [buy *t*]?  
b. ≠ What did Alice [buy *t*] and [go to the store]?
- (36) a. How many courses can a student [take *t*] and [stay sane]?  
b. ≠ How many courses can a student [stay sane] and [take *t*]?

The same is true of what Culicover and Jackendoff (1997) call *left-subordinating and*. Left-subordinating *and* is in many ways parallel to asymmetric *and*, but has a more specific conditional interpretation illustrated in (37).<sup>15</sup>

- (37) a. Alice shows up late one more time and she'll be fired.  
b. Our parents find out about this and we'll be disowned.  
c. The dam breaks and the valley will be flooded.

Culicover and Jackendoff observe that this left-subordinating *and*, when

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<sup>15</sup>Left-subordinating *and* has been most often discussed for the fact that its first conjunct can be an imperative clause, as in: *Move and I'll shoot!* (Bolinger, 1967; Han, 2000; Schwager, 2005; Russell, 2007). Its first conjunct can also be a DP, though the type of the DP is fairly restricted (Culicover, 1970). Finally, a sufficiency modal can occur in the first conjunct, as in: *You **only have to** go to the North End and you'll find good cheese* (von Stechow and Iatridou, 2007), though no other modals can occur in these sentences. In these ways, left-subordinating *and* differs from the simple asymmetric *and* that is the focus of this paper, though Bjorkman (to appear) discusses possible connections between the two at slightly greater length.

embedded, requires TP rather than CP coordination, just as I have argued here is required for asymmetric *and*.

(38) Culicover and Jackendoff (1997), p. 198

- a. You know, of course, that you drink one more beer and you get kicked out.  
(= that if you drink one more beer you get kicked out.)
- b. You know, of course, that you drink one more beer and that you get kicked out.  
( $\neq$  ... that if you drink one more beer you get kicked out.)

Both VP coordination and left-subordinating *and* provide further examples of cases in which the coordination of smaller clausal constituents results in an asymmetric interpretation, and more generally of cases in which *and*'s interpretation and its syntax are closely related to one another.

In the nominal domain, though asymmetric interpretations are not equally apparent,<sup>16</sup> we also find clear connections between the size of coordinated elements and their interpretation. Thus (40-a), with DP coordination, must refer to two individuals, while (40-b) can refer to either one or two (Bergmann, 1982; Dowty, 1988; Winter, 1996, et seq.):

- (40) a. The officer and the lady.  
b. The officer and lady.

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<sup>16</sup>Temporal asymmetries can be found with some nominals, primarily those related to or derived from verbs. When coordinated, these appear to be related asymmetrically:

- (39) a. Someone's falling and breaking a leg was the cause of new safety regulations.  
b.  $\neq$  Someone's breaking a leg and falling was the cause of new safety regulations.

This is again a close connection between the interpretation of coordination and its syntax. Focusing on these kinds of examples, the dissimilarities between *and* and logical  $\wedge$  seem to vastly outweigh their commonalities: at every level of structure, the coordination with *and* admits of asymmetric interpretations, and these interpretations vary with the size of the constituents being conjoined. This puts further pressure on the view that a pragmatic approach to asymmetric *and* is favoured by considerations of theoretical parsimony: this argument assumes that logical  $\wedge$  has a clear advantage in accounting for a broader range of *and*'s interpretations, which does not seem to be the case.

This highlights a yet broader question: why would we suppose in the first place that the connectives of classical logic have precise counterparts in natural language? Why would we be surprised if *and* lacks any such counterpart, any more than we would be surprised to find that natural language is often ill-suited to talking precisely about mathematics?

Indeed, the view that natural language faithfully reflects classical logic has been losing ground for some time. This has been particularly clear in the development of analyses of conditionals, and counterfactual conditionals in particular. The once-widespread view that *if-then* conditionals express the truth-functional relationship of material implication encountered serious problems in accounting for counterfactual conditionals, in addition to the fact that material implication provides unintuitive truth-conditions for natural language conditionals. Early efforts to deal with these problems sought to retain the basics of the material implication analysis, enriched with a theory of pragmatics (Grice, 1975) – much as Grice proposed a pragmatic approach to

asymmetric *and*. Subsequently the modal analyses of Stalnaker (1975) and Lewis (1973) were developed for conditionals, later refined by the modal restriction analysis of conditionals developed by Kratzer (1981, 1986). The modal restriction analysis has the additional advantage of acknowledging the syntactic structure of *if-then* conditionals, which does not map well onto a two-place truth functional operator such as  $\rightarrow$ .

The historical development of the semantic analysis of conditionals has a lesson to teach in approaching the analysis of other basic semantic elements, namely that the contributions of classical logic to natural language semantics do not guarantee that there are lexical items that correspond directly to logical connectives. Just as material implication has been abandoned in the analysis of conditional *if-then*, there is no reason to think that logical conjunction should necessarily survive as the best or most complete analysis of *and*.

This is not to say that there is no role for logical connectives in the analysis of natural language; the very success of formal semantics proves that the tools of formal logic are directly applicable to natural language semantics. It is instead only to argue that there is increasing reason to abandon the longstanding (and very reasonable) hypothesis that the words traditionally used to translate the connectives of formal logic – *and*, *or*, *if*, etc. – are entirely semantically equivalent to those connectives.<sup>17</sup>

Neither is this to say that there is not a great deal of work for semantics – and pragmatics – to do in the analysis of *and*. But it may be that there is little to be gained in

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<sup>17</sup>An anonymous reviewer observes that it seems significant that the inference patterns licensed by  $\wedge$  are also licensed by *and*, which is not the case for material implication and *if-then* conditionals. It is worth noting, however, that the inference patterns licensed by  $\wedge$  are also licensed by two sentences asserted independently of one another, with no syntactic connection between them. The semantics of *and* must therefore account for the fact that both clauses are asserted to be true, but this does not require that *and* be semantically reducible to  $\wedge$ .

relegating asymmetric *and* to the domain of pragmatics: when we consider the wide range of interpretations available to *and* that do not resemble  $\wedge$ , we are faced with a difficult semantic problem, but the syntactic differences that match these semantic differences can provide a scaffolding for a successful semantic analysis.

## 5 Conclusion

As should now be clear, this paper argues that syntax plays a central role, and a wide reaching one, in the grammar of language as a whole, and also in the domain of coordination. This conclusion is a natural one, given that syntax plays a central role in encoding the structural properties that lie at the heart of natural language.

This paper focused on the puzzle of asymmetric interpretations of *and*, a topic previously discussed at the interface of semantics and pragmatics. I have argued that the answer to this puzzle may lie instead at the syntax-semantics interface, based on evidence that smaller clausal constituents participate in asymmetric coordination, while larger clausal constituents (at least large enough to contain the complementizer *that*) participate in *and*'s traditional symmetric interpretation. This proposal has the advantage that it puts asymmetric *and*, often discussed in isolation from other coordination structures, on a clear continuum with other asymmetric coordinations, including well-studied cases of VP coordination and left-subordinating *and*. Though this paper has not developed any specific semantic analysis of *and*, the syntactic facts discussed here provide the foundation for such an analysis. The correlation between interpretations of coordination and the size of conjoined constituents suggests that it is properties of those constituents

that influence the interpretation of coordination, rather than any variation in the denotation of *and* itself. At the same time, the denotation of *and* may be the source of the directionality of the connection between conjuncts, when such a connection is available. There is a great deal of known variation in both the categorial and interpretive restrictions for *and*-like coordinators across languages. Developing a semantics for *and* that accommodates the observations made in this paper may also open the door to a more comprehensive cross-linguistic semantics for coordination.

Two more general points can be distilled from this discussion. The first is that syntax can play a role in solving puzzles of interpretation; indeed, we may often miss relevant syntactic evidence simply because a puzzle has been framed in entirely semantic and pragmatic terms. The second, yet broader, is that too great a focus on traditional logical analyses can obscure the true systematicity of natural language: by departing from an analysis of *and* as  $\wedge$ , a structural approach to variability in the interpretation of clausal coordination becomes possible, in turn giving greater insight into the possibility of a unified approach to coordination across a fuller range of syntactic categories (VP, DP, NP, etc.). As our analysis of natural language advances, we are better able to analyze language on its own turn, granting in turn deeper appreciation of the structure of language.

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