And as an additive particle

Henk Zeevat
ILLC, University of Amsterdam
henk.zeevat@uva.nl

Katja Jasinskaja
IMS Stuttgart/University of Heidelberg
jasinsk@ims.uni-stuttgart.de

1   Introduction

(1)[1] puts a serious problem to those who believe that *and* means the well-known boolean operator or to those who believe it is the dynamic version of that (successive updates with first the left conjunct and then the right conjunct).

(1)   a. It was slippery. John fell.
     b. It was slippery and John fell.
     c. John fell. It was slippery.
     d. John fell and it was slippery.

(1c) has a prominent "backwards" causal interpretation. (1d) clearly lacks this interpretation (in fact it is hard to interpret at all). On the dynamic view and the boolean view however, the two examples come out as semantically identical. In contrast, both (1a) and (1b) prefer an interpretation with a causal connection.

So *and* should have a more complicated semantics, perhaps one that rules out that the second conjunct is a cause of the first (Bar-Lev and Palacas, 1980). But Larry Horn has given a convincing counterexample to a view that this would be part of the truth-conditional semantics of *and*[2].

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[1] The first reference we could find is Gazdar (1978) where the problem is attributed to Herbert Clark.

[2] (2) is an adapted version of Horn's original example cited in Carston (1993, p. 36).

(2) **A:** I don't think John slipped on a banana skin.
   B: Well, he fell and it was slippery.

If *and* meant that the state or event of the second clause of B's answer in (2) did not cause the event of the first clause, there is a problem. Normally, B would imply that A is wrong and that the fact that it was slippery was the cause of John's falling.

The blocking of a causal relation in (1d) therefore comes out as a defeasible property of *and*. But one would like to know how it is possible for lexical items like *and* to have a property of this kind. Conventional implicatures as conceived by Grice (1975) or Potts (2005) are not defeasible. By Grice's detachability test, it also does not seem a good candidate for a conversational implicature. It seemed possible to get rid of the blocking of the causal interpretation both by removing the *and* and by inverting the conjuncts as in (1a) and (1b).

The pattern also does not seem to be dependent on the English conjunction *and*, but appears to be present in all languages that have a conjunction. In fact, the English contrastive conjunction (*but*) rules out a causal interpretation of the second conjunct as well (also in the other direction) and English has a special causal conjunction *for* in which the second conjunct must be the cause of the first (like German has a conjunction *denn* and Dutch *want*). But it cannot be the case that the existence of these alternative coordinating conjunctions block the causal interpretation of the second conjunct because the pattern is also found in languages which do not have this causal coordinating conjunction.

It seems therefore a point of considerable interest to figure out what is going on in (1).

The problem is explicitly addressed in different studies of the meaning of *and*: Blakemore (1987), Carston (1993), Blakemore and Carston (2005) and Txurruka (2003). Blakemore and Carston share the view of Posner (1980) that *and* makes one syntactic constituent out of two, which allows putting the whole conjunction in the scope of semantic operators. They take this idea one step further: the larger constituent will now face the test of optimal relevance (Sperber and Wilson, 1995). This entails that the conjunction as a whole needs to be related to goals and questions in the conversational setting rather than that the individual conjuncts need to be related to these on their own. It would follow that both conjuncts need to be related to the same goals and questions. In (1c), the second clause can address the question why the event in the first clause happened and language users find this interpretation in the attempt to make the second clause optimally relevant. But

this is obviously not a question that could make the first clause itself optimally relevant: it has to be matched to another goal or question. The interpretation of the second clause as the cause of the first is blocked in (1d) because in that case both clauses need to be related to the same goal or question.

This is clearly on the right track and the solution that will be presented in this paper will contain a version of this insight. It is less clear that the Horn counterexample can be dealt with on these lines however and one would like a formalisation. The treatment also fails to explain how related examples of blocked interpretations for the second conjunct—these will be discussed later—can be brought under this same explanation.

Furthermore, while the insight of Posner (1980) that conjunction allows semantic and pragmatic operators to work on the conjunction of two clauses, this can hardly be the explanation of their emergence in the history of languages. Most occurrences of *and* as conjunctions are not in the scope of any semantic or pragmatic operators but are occurrences as the main operator of the sentence. Moreover, in spoken language, the most frequent use of *and* is not as a dyadic or polyadic sentence operator but as a monadic sentence operator[3]. Its usefulness in building complex sentences can at best explain why conjunctions do not disappear under phonological erosion processes, but does not seem to offer a clue as to why they emerged.

Txurruka (2003) generalises the problem by noting that *and* systematically blocks interpretations of the second conjunct as bearing a subordinating discourse relation to the first. It is customary and correct (Mann and Thompson, 1988; Polanyi, 1988; Hobbs, 1985; Prüst et al., 1994; Asher and Lascarides, 2003) to divide the discourse relations into a group of coordinating relations (*Narration, Result, List, Contrast*) and a group of subordinating relations (*Reformulation, Explanation, Justification, Elaboration*). The division rests on an analogy between coordinating and subordinating connectors within the sentence. The analogy is however far from perfect. E.g. syntactic subordinating connectors that realise *Reformulation* or *Elaboration* do not seem to be forthcoming, effects can be syntactically subordinate to their causes, and *Contrast* in concessives (*although*) gives rise to syntactic subordination. And, as noted above, *Explanation* (the cause after its effect) can be realised in English, German and Dutch by coordinating connectors.

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[3]Especially when turns are short. In such dialogues, there are 3 monadic uses for 2 dyadic, with longer turns it drops to about 1 in 3 (data from MICAW and Pittsburgh corpora). Proper counting presents a number of methodological problems, however. Compare also Chafe and Danielewicz (1987).

But the division finds a proper motivation in the possibilities for attachments and can be tested by the possibility of anaphora. A clause C coming after A and B cannot take A as its pivot, if A and B stand in a coordinating relation. In particular, this entails that pronouns in C cannot be bound from A. If B is subordinate to A, A can be C's pivot and bind pronouns in C. In schema:

(3)   a. coord(A,B). C: no pronoun in C is bound from A
      b. subord(A,B). C: pronouns in C can be bound from A

This motivates the distinction by providing a test. If the test isolated a natural distinction, the distinction could be used for stating a generalisation from which the motivating problem (1) of this paper is a special case. It also solves the generalised problem by making *and* the marker of coordination: clauses linked by *and* can only be connected by coordinating discourse relations, subordinating discourse relations are ruled out.

To see that this captures a generalisation consider the examples (4).

(4)   a. *Explanation*:
         John fell. It was slippery.
         John fell and it was slippery.
      b. *Reformulation*:
         Alena broke her skis. She lost her only means of transport.
         Alena broke her skis and she lost her only means of transport.
      c. *Elaboration*:
         Alena broke her skis. She hit a tree.
         Alena broke her skis and she hit a tree.
      d. *Justification*:
         John fell. Bill told me.
         John fell and Bill told me.

In all four cases, the asyndetic connection gives rise to a prominent reading which is missing when *and* is inserted. In (4a), it is *Explanation* (the second sentence gives the cause of the first), in (4b), *Reformulation* (the second sentence gives another description of the same event), in (4c) an *Elaboration* (the second sentence specifies a subevent of the first) and in (4d) a *Justification* (the speaker specifies how she got to know the fact reported in the first sentence).

The generalisation seems accurate (apart from the counterexamples that will be discussed later) and the idea that *and* marks coordination is a natural one, if coor-

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dination/subordination is a natural distinction to make.

We see two problems however. The first problem is how *and* manages to carry out its task of marking coordination. Does it have truth-conditional content which causes it to rule out subordinating relations? Or does it have a conventional implicature which has its consequence that a coordinating relation is forced? And if it makes sense to have a marker of coordination, how can such a marker emerge in the history of English and many other natural languages?

On Txurruka's account the marker seems a direct instruction to a parser of discourse structure: Do not link me with a subordinating relation even if that is plausible. Markers that help discourse parsing are common enough. For example, sentence-initial *because* rules out all relations except *Explanation* and sentence-initial *then* rules out relations like *Explanation*, *Justification*, *Elaboration*, *Reformulation* and *List*. But they do so by means of their truth-conditional content. Even markers of contrast like English *but* or Dutch *maar* have a transparent relation with other uses where they express exception or limitation, so again other relations than *Contrast* or *Concession* are ruled out conceptually. It therefore seems a legitimate question to ask in virtue of what property *and* manages to mark coordination. Words do not seem to just signal something to the discourse parser. Words either express a semantic relation or have a conventional implicature associated with them. That lets them mark a specific discourse relation like *but* or rule out other discourse relations like *then*.

The second problem is with the treatment of the Horn counterexample. In treating it, Txurruka exploits the logical space between a discourse relation and the semantic relation it expresses. If the discourse relation holds, the semantic relation associated with it must hold as well, but the inverse does not need to be the case: the semantic relation of causation can hold between the second conjunct and the first, without the discourse relation of *Explanation* obtaining between them. In the Horn counterexample, the second conjunct is the cause of the first, but the second conjunct does not bear *Explanation* to the first.

While we would concede that there is a certain imperfection about the second conjunct being an *Explanation* of the first in the Horn counterexample—and quite a lot to be discovered about its intonation—we do not think it can be denied that it is one. Discourse relations are not part of a created or natural linguistic order. They are a classification of the steps a speaker can take in forming a text and are given by the intention of the speaker behind that step. So an *Explanation* would be a clause that intends to specify the cause of the pivot. It is clear in the example that the pivot is the first conjunct and that the second conjunct in fact

and quite on purpose specifies its cause. It therefore is an *Explanation*. But it is made under unusual circumstances: the interlocutor A knows the explanation already and denies that it is one. This explains the imperfection. The imperfection explains the special intonation and the optional presence of correction markers like *well* that can be observed in the Horn counterexample and similar cases.

The attempted separation of the discourse relation and its defining semantics (the intention to specify the cause) leads to a problem with cases where—unlike in the Horn example—the speaker seeks to exclude a causal interpretation of the second conjunct by using *and*, like *John fell and it was slippery*. If rhetorical *Explanation* were not entailed by causality, *and* would be unable to achieve the effect of ruling out causality. The second conjunct would not be a formal *Explanation* anymore but that would no longer be enough to rule out that it is the cause of the first conjunct. Given the fact that it being slippery is as good a cause for falling as they come, one would rather expect a causal interpretation to be available. But it clearly is not[4].

So we conclude that Txurruka's treatment of the Horn example is not tenable. And this would appear to threaten her treatment of *and* as a whole.

The goal of this paper is to solve both problems: how does *and* manage to rule out subordinations? And what is going on in the Horn counterexamples? The first problem will be solved by making it plausible that *and* is a restricted additive particle. Section 1 will give arguments for this assumption and section 2 will analyse the notion of additivity and gives a formal treatment that generalises to a clausal arguments. Section 3 develops the Horn counterargument to its full strength and shows that it is just as destructive for our (and anybody's) treatment of additivity. Section 4 saves *and* and additivity from the claws of the dragon.

2   Origin and Function of *And*

1. Coordinating conjunctions like *and* have additive particles and adverbs as their source.

Mithun (1988) gives an overview of the sources of *and* in various languages. An important finding is that not all languages have developed a conjunction and that it is also not a universal phenomenon that the same word is used for NP conjunction and for clausal conjunction. Typical sources for NP conjunctions are

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[4]A longer discussion of this issue is in Jasinskaja (2007b).

comitative markers like *with* and additive particles like *also, too, as well*. Sources for clausal conjunction are temporal adverbials (*then*, *now*), causal adverbials (*so*) and additive adverbials like *also*, *besides*, *moreover* and *furthermore* and, perhaps surprisingly, pause fillers like *ehm...*

The overwhelming majority are additive elements or elements that can pragmatically imply distinctness between the constituent they appear on and the pivot or some other constituent they relate to.

(5)   The fishermen cleaned the fish with Fred.

(5) entails that Fred is not one of the fishermen.

And Fred might say (6) after telling about his adventures.

(6)   So I had to walk home..

(6) would state an event distinct from the adventures themselves.

Similarly, *then* signals a change of temporal location and *now* seems to do quite the same thing. The typical *and*-source signals distinctness and this is precisely what additive particles seem to do. The fact that the sources are additive or similar to additive does not mean that *and* itself is additive. But if one would like to claim that it is not, one would need to give an account of how it came to lose its additive properties. On our account, *and* used to be additive and it still is. The additivity of the sources would also explain why the sources were recruited for this new additive role.

2. *And* can also be a sentence-initial adverb which is probably the source of the two-place conjunction.

A similar argument is the existence of the one place-version of *and* as in (7). It is highly similar to two-place *and*. E.g. the examples in (4) with two-place *and* have the same interpretation as the examples that can constructed from the asyndetic examples by adding one-place *and* to the second clause. One-place *and* even appears to be more frequent in spoken discourse than two-place *and*.

(7)   *And* John gave him a push.

Since the sources of *and* are generally adverbs, one-place *and* would seem to be somewhere in between these adverbs and two-place conjunction, and presents a stage in the development of a two-place conjunction. An account like Posner's

which wants to account for conjunction from its function of building a complex sentence out of two simpler sentences is not applicable to one-place *and* and cannot account for the similarities. We can just say that the two *and*s share an additive semantics and that two-place *and* derives from one-place *and* in the following way.

Additive particles and adverbs take a sentential antecedent, often the previous sentence. Under these circumstances the sentence and its antecedent can be planned together and pronounced without realising a pause and falling boundary tone to mark the separation between the sentences. The sentence-initial adverb or particle can then be reanalysed as a connector and the first clause as the fixed antecedent for the additive marker starting the second.

For this account to work, it is crucial that the developing connector requires a sentential antecedent. Additivity, concessivity, contrastivity, adversativity and causality would all meet this requirement, but only additivity can be made plausible as a meaning for *and*. That one-place *and* requires an antecedent is confirmed by the impossibility of discourse initial sentences with a one-place *and*.

3. *And*'s role in marking discourse structure.

A third line of argumentation follows the generalisation given by Txurruka and a recent treatment of defaults for discourse relations by Jasinskaja (2007b) (see also Jasinskaja (2006) and Zeevat (2007)). According to these treatments, the defaults for rhetorical relations are as follows.

(8) $Reformulation > Elaboration > \genfrac{}{}{0pt}{}{Explanation}{Justification} > \genfrac{}{}{0pt}{}{List}{\genfrac{}{}{0pt}{}{Narration}{Result}} > \genfrac{}{}{0pt}{}{Contrast}{Concession}$

The scheme is able to explain why there are no grammaticalised markers for *Reformulation*, *Elaboration*, *Explanation* and *Justification* (there are lexical markers) and also why *and* can change the readings in (4) dramatically. The readings obtained by inserting *and* do not seem to be accessible without it.

Within this scheme, *and* marks the boundary between the upper and the lower group and belongs typically to *List*, *Narration* and *Result*. *Contrast* and *Concession* have their own markers.

The boundary can be explained conceptually as the point where the sentence topic of the pivot is abandoned to start dealing with a new topic. *Reformulation*, *Elaboration*, *Explanation* and *Justification* still deal with the pivot topic. *List*, *Narration* and *Result* continue with a superordinate discourse topic, but start on a new part

of that. In *Contrast* and *Concession*, the discourse topic also changes and there are specialised markers for these relations. In this way, *and* seems to mark a distinct sentence topic under the continued discourse topic. This can be connected to additivity: the change of sentence topic under a continued discourse topic makes the two sentences distinct contributions to the discourse topic.

4. The same word can be both a conjunction and an additive marker.

There are examples of languages where conjunctions double as additive particles[5]. The Russian word *i*, for instance, can function both as a conjunction (*and*) and as an additive particle similar to *also* (Uryson, 2000, 2005). It seems moreover that additive particle uses like (9a) with *i* in front of the NP in focus can often be paraphrased by putting *i* in the beginning of the utterance (9b)[6], and by making

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[5]Malchukov (2004) connects conjunctions with additive and mirative markers in a semantic map. In this method, the reason for connecting two concepts (additivity and conjunction) is the existence of a language where the two concepts are expressed by the same lexeme. We turn this around to some extent and conclude to identity between the concepts, or rather, to conjunction of additivity to some categories only. And additive particle restricted to NPs would be a similar restriction.

[6]There is a range of restrictions on using *i* in the beginning of a full sentence. Recovering the elided material in (9b) would give *I on poceloval Lenu* 'And he kissed Lena', which is not ungrammatical and could certainly be interpreted in an additive fashion, but is pragmatically anomalous (a) for the same reasons why non-eliding highly activated material is marked in e.g. English in similar contexts, and (b) because of the competition with another particle *ešče* whose additive use seems more appropriate in front of a full sentence: *Ešče on poceloval Lenu*. In contexts that do not trigger this kind of ellipsis, e.g. where the subjects of the sentences do not corefer, *i* competes with another conjuction *a* (cf. e.g. Kreidlin and Padučeva, 1974) and develops additional semantic effects that can be roughly characterised as causal (Sannikov, 1989). Interestingly, however, even causal uses of the conjunction *i* allow for a paraphrase with the particle *i* (cf. Uryson, 2005, p. 384):

(i) a. Ego   pozvali,   on   i   prišel.
         *he.*ACC *called.*3PL *he   therefore came*
     b. Ego   pozvali,   i   on prišel.
         *he.*ACC *called.*3PL *and he came*
         He was called and so he came.

In this type of use the particle *i* is, of course, not purely additive, but the parallelism with the usage of *i* as a conjunction demonstrates once again that there is a strong functional, and probably also historical, connection between the conjunction and the particle *i*. It is a question for future work to see if the information-structural restrictions on *i* as a conjunction can be connected to its syntactic and information-structural limitations as an additive particle, as seems plausible. The whole subject of restrictions on the use of additive particles (limitations on the focus with which associates) has barely been addressed.

that into a conjunction of NPs (9c):

(9) a. Vanja poceloval Mašu. On poceloval i   Lenu.
       Vanja kissed   Maša he kissed   also Lena
       Vanja kissed Maša. He also kissed Lena.
    b. Vanja poceloval Mašu. I   Lenu.
       Vanja kissed   Maša and/also Lena
       Vanja kissed Maša. And Lena.
    c. Vanja poceloval Mašu i   Lenu.
       Vanja kissed   Maša and Lena
       Vanja kissed Maša and Lena.

The Russian *i* thus can be compared with the German *aber* that can appear both
as a particle (10a), a one-place utterance-initial marker (10b), and as a contrastive
conjunction (10c) without any apparent difference in meaning:

(10) a. Peter ist schnell gefahren, kam   aber zu   spät.
        Peter is   fast   driven   came but   too late
        Peter drove fast, but came too late.
     b. Peter ist schnell gefahren. Aber er kam   zu   spät.
        Peter is   fast   driven   but   he came too late
        Peter drove fast. But he came too late.
     c. Peter ist schnell gefahren, aber er kam   zu   spät.
        Peter is   fast   driven   but   he came too late
        Peter drove fast, but he came too late.

Another case where *and* has a double life as a conjunction and an additive parti-
cle is the modern Greek conjunction *ke*. Giannakidou (2007) gives the examples
in (11):

(11) a. Irthe ke   o   Janis
        came and the Janis
        Also/even Janis came.
     b. Fere ke   fruta
        bring and fruit
        Bring also fruit.

3 Additivity

Gazdar (1978) and in his footsteps Soames (1982) give a simple analysis of the additive particle *too* associating with a proper name a. In this analysis: $S(a)$ *too* presupposes $\exists x(x \neq a \wedge S(x))$ and asserts $S(a)$.

In reaction to Soames, Kripke (ms) developed a counterargument to the analysis, based on (12).

(12) John is having dinner in New York, *too*.

If (12) were really presupposing what Gazdar and Soames say it does, the presupposition would be vacuous since everybody knows that millions of people are having dinner in New York every evening. But it is not: (12) cannot be used unless there is another person given in the discourse as having dinner in New York.

The problem can be solved in file change semantics or discourse representation theory by demanding that the presupposition is properly given in the discourse. To be precise, $S(b)$ should be given in the information state representing the current discourse and $a \neq b$ should be addable to the discourse without giving rise to inconsistencies. $S(b)$ itself cannot be accommodated since the results of such an accommodation would again lead to vacuous presuppositions. The use of too is informative only when the distinctness between a and b is not given yet, or when there is an incomplete match between S as it occurs with a and S as it occurs with b.

(13) a. My boss gave me some flowers. Harry did *too*.
       (new information: Harry is not my boss)
     b. John was ill. Harry had the flue *too*.
       (new information: John had the flu when he was ill)

Strangely enough, the discussion about too seems to have been concerned more or less exclusively with proper names. Additive particles however associate with many other constituents and even with sequences of constituents.

(14) a. Every boy came to the party. Mary came too.
     b. Few boys came to the party. Mary came too.

(14) illustrates what is going on when one considers other NPs. The solution adopted above for proper names can be generalised, if one assumes (e.g. with

Kamp and Reyle, 1993) that other NPs refer too and that this reference can always be represented by a variable denoting a set. Distinctness can then be reanalysed as disjointness between these sets: $x \cap y = \emptyset$.

But (15) shows that this is still not enough. Here *too* associates with the meaning of the two *I*s (A and B) and the two *you*s (B and A). This can be seen as asking for the distinctness of the pair which seems to boil down to: the pair a is distinct from the pair b iff $a_0 \cap b_0 = \emptyset \wedge a_1 \cap b_1 = \emptyset$.

(15) **A:** I love you.
     B: I love you too.

In (16), the associate is a VP. Intuitively, *too* still implies distinctness. John is not one of those apparently numerous men who manage to shave as part of taking their morning shower. But there is not some obvious set in this case that could be disjoint.

(16) John had a shower. He shaved too.

This is the same in (17)[7]. Interpretations in which Mary does her dance as part of John's rendering of the song are out. But there is no clear set that could be the basis of a proper definition of distinctness.

(17) John played a song on the piano. Also Mary performed a DANCE.

3.1   Questions and Generalised Additivity

A more general formulation of additive clauses is necessary. We propose the following:

1. An additive clause is a disjoint answer to an already addressed topic question.

2. Additive markers mark additive clauses.

3. The topic of the additive clause matches the topic question.

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[7]Small capitals in (17) indicate the nuclear pitch accent (the last accent in the phrase). It is essential that the whole sentence and not just *Mary* is in the scope of *also*. Opinions are divided over the acceptability of this example with *too*. It also works with German *auch* or Dutch *ook*.

The new formulation brings in "association with focus", since the question can be recovered from the sentence with its intonationally marked focus.

(18) a. Who came to the party?
  b. Every boy came to the party. Mary came too.
  c. Few boys came to the party. Mary came too.

(19) **Q:** Who loves whom?
  A: I love you.
  B: I love you too.

(20) a. What did John do just now?
  b. John had a shower. He shaved too.

(21) a. What happened at Bill's party?/Why did Bill get annoyed?/Who did what?
  b. John played a song on the piano. Also Mary performed a dance.

The notion of a wh-question makes it possible to associate sets with propositions and thereby with disjointness. In the question theory of Groenendijk and Stokhof (1984), wh-questions $?xPx$ have propositional answers p that correspond to sets of objects X since the possible semantical answers p correspond to sets X by the equivalence $\Box(p \leftrightarrow [X = \lambda xPx])$. In a world i, $?xPx$ denotes the exhaustive semantic answer to $?xPx$. So if X is the set of objects that have the property P in i, $?xPx$ denotes p with the property $i \models \Box(p \leftrightarrow [X = \lambda xPx])$.

In the context of additivity however, one should not have exhaustive answers: additive clauses add another disjoint non-exhaustive answer to the topic question.

So answers to a question $?xPx$ must be redefined as $p = \forall x \in X Px$, for $X \neq \emptyset$. This gives non-exhaustive semantic answers and allows the definition (22).

(22) $answer(p, ?xPx, i)$ iff $i \models \exists X(X \neq \emptyset \wedge \Box(p \leftrightarrow \forall x \in X Px)$

The empty set must not count as a non-exhaustive answer, since it would be an answer to any question, even if the extension of P is empty and only negative answers are appropriate.

Disjointness between answers p and q to $?xPx$ in i can now be defined as follows.

(23) $\neg \exists r(answer(r, ?xPx, i) \wedge \Box(p \rightarrow r) \wedge \Box(q \rightarrow r))$

This guarantees the disjointness of the corresponding sets.

It is easily checked that the definition gives the right result for simple wh-questions like in the cases of (18) and (12).

It is not trivial however to relate natural language answers of the form $NP(P)$ to the semantic answers. This requires a notion of reference for plural NPs and quantifiers. Such a theory can be developed with the ideas of Evans, but is also part of the treatment of plurals developed in Kamp and Reyle (1993).

Evans (1977) considers the difference between (24a) and (24b)

(24) a. John has (many/a few/few/3/some) sheep. Harry shears them.
     b. John has (many/a few/few/3/some) sheep that Harry shears.

In (24a), Harry shears all the sheep that John owns (i.e. $sheep(i) \cap \lambda x$John has $x(i)$), in (24b) only a subset of those. The explanation is that the pronoun in (24a) in a world i picks up the referent of the NP in i which is the set $N(i) \cap P(i)$. Following this reasoning, it is possible to identify referents for a much larger class of NPs[8]:

If $S = P(NP)$ and $NP = Det\ N$, the referent of NP in i can nearly always be identified with $X = N(i) \cap P(i)$.

Ignoring proper indefinites, answers of the form $(Det)N(P)$ denote the answer to $?xPx$ in i that is given by $N(i) \cap P(i)$. They fail to do so if $N(i) \cap P(i) = \emptyset$ or if there is a conflict between the content of the determiner and the size of the set or the size of the set as a proportion of $N(i)$. In this way, (25) would eliminate possibilities in which no students attended or a number of students attended, but more or less than three, when it is taken as an answer to *Who attended the lecture?*

(25) Three students attended the lecture.

The relational case (15) seems straightforward, but it is not. The question one needs to assume is a double wh-question: $?xy\ x\ loves\ y$, indicated in (15) by the stress in *I love you too* on *I* and *you*. The definition of additivity as such however does not guarantee that both projections need to be disjoint: one disjoint projection suffices for the non-existence of a common part in the answer. Perhaps this can

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[8]The exceptions are proper indefinites, like *this man* in *There was this man* or *one girl* in (i).

(i)   There was one girl who had an ice cream. Another girl had an ice cream too.

be solved by letting the double disjointness be the effect of the contrastive stress. The disjointness of both projections entails the disjointness of the pair answer to the double wh-question.

It is to VP- and S-additivity that this paper hopes to make a real contribution. A necessary precondition is the ontology assumed in much work on discourse interpretation and on the interpretation of tense and aspect: the domains of possible worlds are made up from both spatio-temporal continuants and temporal objects like events and states. Typical formal languages for dealing with this ontology include statements like $holds(s, t, p)$ (State s holds at p on t), $happens(e, t)$ (event e happens at t), $location(e, p)$ (e happened at t), $theme(s, x)$ (x is the theme of state s), $agent(e, x)$ (x is the agent of the action e), $V\text{-}ing(e)$ (e is of the type expressed by the verb V), $V\text{-}ing(s)$ (the state s is of the type expressed by the verb V).

In such a language, questions that can be answered by VPs and Ss are of five kinds:

(26) what happened to x at t?
     how was x at t?
     what happened at t?
     how were things at p and t?
     what caused e or s?

The questions can then be constructed as wh-questions that are answered by sets of events and states.

(27) $?e\varphi(e)$
     $?s\varphi(s)$

In this way, one obtains a full reduction to normal wh-questions.

But the problem of NP denotation does not seem to apply to VP- and S-questions: the denotation is just the event or state on the basis of which S holds in i or on the basis of which $VP(x)$ is true.

This means that the question can always be used as a domain of propositional answers or as a domain of sets in which disjointness and identity of answers can be defined, provided a world is chosen to settle the questions what objects, events and states there are and what sets can be formed from those.

For example consider (28) as an answer to a question: *What annoyed John?*

(28) Bill played a song on the piano. And Mary performed a dance.

In a world i where John got annoyed, the question denotes sets of causes of John's getting annoyed. One of those could be the singleton $\{e\}$ of John's rendering of the song on the piano. The same answer to Q can only exist in those worlds where that same event exists. If *And Mary performed a dance* is an additive clause, in i it should denote a distinct event that is an answer in i to the question as well. This would not be the case if in i the dance were part of the song or inversely.

The actual world is responsible for questions of truth. For p to be a true answer to Q, p must hold in the actual world and must be a member of $\{q : answer(q, Q, a)\}$.

The elements of information states are the candidate actual worlds for the subject of the information state. In this way such a subject believes that two answers to Q are disjoint iff they are disjoint in each element of her information state. Common grounds are just special information states with a plural subject.

Additivity is given for a speaker if the question has been answered previously with an answer that is disjoint from the current answer. She can then mark the clause with an additive marker. The disjointness can follow from the formulation of the two answers or can be given in the common ground. But it suffices that the speaker believes to know that the two answers are disjoint, this fact does not need to have been made public before.

The hearer checks that additivity is given by identifying the question (using the information structure of the additive clause) and the earlier disjoint answer to it. The question, its previous answer and the disjointness can be in the common ground. The question and its previous answer cannot be accommodated, but the disjointness of the previous and the new answer can.

This means that an additive clause only defines an update of the common ground iff the common ground contains the question and its previous answer and it is consistent with the common ground that the additive clause is a disjoint answer to the same question. The update is in that case both the answer supplied by the additive clause and its disjointness with the previous question.

Similarly an additive clause is true in a world i iff its content is true in i and the previous answer is disjoint from the content with respect to the question. If disjointness fails, it would be inappropriate.

This section has tried to be precise about additivity, because it will turn out to have problems. Nevertheless it comes a long way in dealing with the problems that we set out to solve.

4 *And* has an additive semantics

Finally, the point is reached where the central thesis of this paper can be stated in an intelligible way. In (2), we made the case for clausal two-place *and* deriving from a sentence initial particle with a meaning comprising additivity in which the antecedent was fixed to be the first conjunct. In the last section, a semantics for additivity was given. Drawing both together in an *and*-conjunction, the second conjunct is a disjoint answer to the question that was answered by the first conjunct.

Now reconsider the motivating problem.

(29) a. It was slippery. John fell.
　　 b. It was slippery and John fell.
　　 c. John fell. It was slippery.
　　 d. John fell and it was slippery.

There are four points to make.

1. If *it was slippery* in (29d) were answering the question *Why did John fall?* (i.e. it would be an *Explanation*), it would not answer the same question as the first conjunct.

2. In (29c) there is no *and* and therefore the two clauses do not have to be disjoint answers to the same question. So the second clause can be an *Explanation* of the first.

3. (29a) and (29b) present *it was slippery* before *John fell* as answers to a question like: what happened at t? In both cases, this allows an inference from the order of the sentences to the fact that John's falling was contingent on it being slippery (*Narration*) and the further inference (based on the knowledge that it being slippery is a good cause for falling) that it being slippery was the cause of John's falling (*Result*).

4. In (29d) the order is reversed. So *it was slippery* can be contingent on John falling. This is implausible here, which explains the marginality of the example, but it would be plausible if John were carrying a bottle of oil and spilt it as a consequence of falling, compare (30).

(30) John switched off the light. It was pitch dark.

So the motivating problem is solved.

The other problem was the absence of "subordinating" discourse relations when *and* is present. This can be explained by the two aspects of the notion of additivity given in the last section: the two conjuncts p and q must address same question and as answers to that question they must be disjoint. One can attempt two ways of interpreting q as an *Explanation* of p: either it is an answer to the question *Why p?*, but then p should also be an answer to *Why p?*, which is impossible (the same applies to interpreting the second conjunct as an answer to the question *How did I come to know that p?*—p itself can never be an answer to that question), so this option is in conflict with both conjuncts answering the same question; or the question that p was addressing (e.g. *What happened?*) needs to be adressed again because p did not answer that question satisfactorily (was e.g. unclear or unconvincing) and is not accepted by the hearer. But q does not provide a disjoint answer in this case. The speaker is still trying to say p in giving q in support.

The assumption that the second conjunct is an *Elaboration* or *Reformulation* of the first is in conflict with the second aspect of additivity: the disjointness of the answers as answers to the common question. Since *Reformulation* specifies the same underlying event in a different way the two answers will never be disjoint. *Elaborations* (including *Backgrounds*) specify parts of the event or state they elaborate on. Again this conflicts with the assumption that both answers are disjoint.

So Txurruka's generalisation follows from the assumption of additivity as well. The role of *and* in breaking the Jasinskaja's defaults (4) for interpreting asyndetic connections is thereby explained and the defaults themselves could be part of an explanation of the grammaticalisation of an additive connector *and*: they explain why *and* is useful.

Moreover, one- and two-place *and* can have the same function and one-place *and* is just as useful.

It would be nice if this paper could stop on this happy note. But it cannot, because of the existence of generalised Horn counterexamples. Here they are.

(31) a. Well, John fell and he slipped on a banana skin. ("explanation")
    b. Alena broke her skis and thereby she lost her only means of transport. ("reformulation")
    c. Well, John was shot and I saw Mary take the gun. ("justification")
    d. The council built the bridge and John drew up the plans. ("elaboration")
    e. The council built the bridge and John did the steel construction. ("elaboration")

Each and every observation above seems to be falsified.[9] Their status as counterexamples is not changed by the fact that a correction marker *well* has to be employed in two cases and the adverb *thereby* at another occasion. If *and* is additive, it should continue to be so if it is combined with other material.

5 Horn counterarguments for additive particles

Fortunately, the Horn counterarguments for conjunction can be matched by the same counterarguments for additive particles. Some care must be taken: not all additive particles can be used all the time[10]. But in all cases one can find an additive particle to reproduce the counterargument.

(32) a. Well, John fell. He also slipped on a banana skin ("explanation")
   b. Alena broke her skis. Thereby she also lost her only means of transport ("reformulation")
   c. Well, John was shot. Also I saw Mary take the gun. ("justification")
   d. The council built the bridge. John also drew up the plans. ("elaboration")
   e. The council built the bridge. John also did the steel construction. ("subevent elaboration")

The depressing reasoning at the end of the last section could be repeated here. Additive particles appear to lack additivity. And not just in the cases where one is trying to reproduce *and* by means of an additive particle.

Imagine for example the situation where A is asking B whether he invited the doctor and the mayor for the opening of her shop. B knows that these are same woman and he in fact invited her. He can then say (33).

(33) I invited the doctor. And in inviting her, I also invited the mayor.
   The doctor is the mayor, didn't you know that?

---

[9]The scare quotes around discourse relations in (31) are intended to express respect for the feelings of those people who are reluctant to treat these examples as instantiating these discourse relations in the technical sense. However, if (as we hold) *Explanations* are just explanations (utterances explaining their pivot), then "explanations" are *Explanations*.

[10]We have been unable to find a systematic account of these differences in the literature. The differences all concern the semantic scope of the particle. The variation is from single constituent with categorial limitations to full sentences. The investigation is complicated by other uses of the same particles.

It seems better to try to repair the earlier definition of additivity so that at least the additive particles become additive again. But before embarking on that, it is proper to remark that indeed there are markers of additivity in the sense defined in section 3. These are adverbs, like *in addition to that* or *like x*. These are systematically bad (or at least worse) when used in Horn counterexamples.

(34) ?? The council built the bridge.
     In addition, John did the steel construction on it.

(35) ?? Alena broke her skis.
     In addition, she thereby lost her only means of transport.

(36) John dreamed/claimed he was going to Spain.
     a. ? I am also going there.
     b. ?? I am going there just like John.

(37) ?? I invited the doctor. And in inviting her, in addition to that I invited the
     mayor. The doctor is the mayor, didn't you know that?

It seems correct to connect this observation[11] to the degree of grammaticalisation of the different markers. Typical for grammaticalised markers is that their presuppositions do not need to be properly the case: the presupposition can appear under an operation like: *it was suggested that*, *John thinks that*, and others. In fact, Zeevat (2002) notes that this behaviour is typical for *too* and other particles. (38) gives some representative examples.

(38) a. (two children are phoning each other from the corridor phones)
        A: My parents think I am in bed.
        B: My parents think I am also in bed.
     b. John is maybe going to Spain. I am going there too next month.
     c. John dreamt he would fail the test. And indeed he did.
     d. John dreamt he would fail the test. He got the highest mark however.

The antecedent of *also* in (38a) is the false thought attributed to A's parents that A is in bed. The antecedent of *too* is the merely possible trip of John to Spain . The antecedent of *indeed* and *however* in (38c) and (38d) is the content of the dream.

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[11]A similar observation is made in Beaver and Clark (2006) in connection with *only* vs. *exclusively*.

The solution to the problem with *and* and additivity can be inspired by the solution to these cases: one can develop a notion of weak presupposition where a presupposition p does not need to be true on the common ground, but can be true on the common ground under one of a range of operators (*x dreams that...*, *x believe that...*, *maybe*, *x says that...*, etc.) or an iteration of them. Weak presupposition is typically needed for making sense of particles. Normal presupposition triggers all require strong presupposition.

For the Horn counterexamples, it turns out to be sufficient to consider only one operator: epistemic possibility on the common ground: speaker and hearer do not agree yet that the two answers are not disjoint.

It is typical of Horn counterexamples that they correct the common ground in this respect: the answers become non-disjoint if the Horn counterexample is accepted by the hearer.

Epistemic possibility captures (38b), but not (38a) which requires a different operator from the list (*A's parents think that...*).

So disjointness on a CG must be weakened to possible disjointness. Two answers are possibly disjoint on a common ground CG if the CG does not have the information that they are not disjoint. It is enough that there is one world i in the common ground in which the two answers φ and ψ are disjoint answers to the question.

In Horn counterexamples, the answers are possibly disjoint on the common ground. The possible disjointness justifies additive marking. Typically the speaker of the additive clause does not believe in the disjointness: the Horn counterexamples aim to correct the common ground in establishing overlap.

It may seem paradoxical to have utterances that both presuppose and correct some matter of fact, but the phenomenon is not unknown.

(39) a. The king of France is NOT bald. There is no king of France.
    b. John is coming after all.

The king of France in (39a) presupposes the existence of this king and the opinion of the speaker asserted in (39a) is not sufficient for ruling out its use. Only after the correction and its acceptance, *the king of France* cannot be used anymore. Likewise (39b) (weakly) presupposes that John is not coming while asserting that he is[12].

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[12]There is an issue here. Should the common ground be so conceived that whatever is said or

The following three representative Horn counterexamples can be accounted for by weakened additivity.

Explanation:

(40) **A:** John did not fall just because it was slippery.
　　　　He is an experienced climber.
　　B: Well, he fell and it was slippery.

question: what happened when John fell?

disjointness: according to A, and so according to a possibility in the common ground, it being slippery is unconnected with John's falling

B's *well* makes it clear that B does not agree with A. B happens to know that John fell and that it was slippery, but A denies the connection (and so they are possibly disjoint in the common ground). Nevertheless, for B this is sufficient to reach the conclusion that John in fact fell because it was slippery and therefore not disjoint according to B.

Reformulation:

(41) Alena broke her skis and thereby she lost her only means of transport

question: what happened to Alena?

disjointness: the common ground does not contain the fact yet that Alena has no other means of transport apart from her skis. Alena can still lose her only means of transport by losing her bike as far as the common ground is concerned.

If the common ground already contained the information that the skis are Alena's only means of transport, the example would be strange.

Thereby corrects the CG on the point of disjointness.

Elaboration:

(42) The council built the bridge. John also did the steel construction.

---

suggested is temporarily part of it? Or should this behaviour be limited to weak presupposition, with particles merely marking a certain state of the common ground without making any claim about the correctness of that state. The second possibility seems an attractive option, but a different account would be necessary for what goes on in (39a), e.g. local accommodation under negation.

question: What happened with the bridge plan? Did John do the steel work?

answers: The council did it. John did the steel construction.

The common ground has not ruled out yet that they built the bridge without John doing the steel construction.

In that possibility the event of the council building the bridge shares no subevent with the possible but not actual event of *John doing the steel construction*. John's steel construction is interpreted by bridging to the bridge-building and thereby disjointness is corrected.

6 Conclusions

We presented the case for looking at clausal conjunctions as syntactically restricted grammaticalised additive particles. We offered historical and typological arguments for this point of view, but the synchronic argument is the strongest: it is possible to explain the restrictions on the discourse relation the second conjunct can bear to the first merely by this assumption.

The argument is strengthened by the fact that the same restrictions apply to independent additive clauses, marked by one-place *and* or other additive markers with respect to their antecedents.

The main contribution of this paper is possibly the analysis of general additivity. It seems to apply even to the puzzling case noted by Doherty (1987), if both parties are taken as addressing the question of the quality of the wine, with different states of the wine offered as an answer.

(43) **A:** Das war ein guter Wein.
         That was a good wine.
     B: Es war auch der teuerste Wein im Geschäft.
         It was (additive particle) the most expensive wine in the shop.

Further study should reveal why *auch* or Dutch *ook* can express this kind of connection, which seems to be absent for e.g. the English or Russian additive particles.

The Horn counterexamples to the restrictions for *and* turn out to be systematically matched by similar counterexamples to strict additivity with proper additive particles like *also*. Apparently only lexical expressions of additivity do not seem to

allow them.

The Horn counterexamples are then merely a reflection of the fact that functional expressions of additivity (grammaticalisations of lexical expressions of additivity) can (like many other particles) take antecedents that are merely possible or suggested. The notion of weak additivity that is developed in the paper only needs the common ground to contain a possibility that the two answers to the question are disjoint.

One word of caution. While Jasinskaja (2007a,b) was able to show that the asyndetic versus conjunctive connection between NPs has much the same properties (*John, the butcher* refers to one person, *John and the butcher* to two), this seems to be quite different for noun and VP conjunctions. It is not a claim of this paper that all uses of *and* are additive. The other uses can presumably be seen as further grammaticalisations of additive *and*.

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