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A Presuppositional Account of Causal and Temporal Interpretations of *and*

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Abstract Despite extensive studies, the issue concerning the pragmatic mechanisms leading to causal and temporal interpretations of *and* remains problematic and has not yet been addressed in its totality within one framework. This paper proposes a solution based on presuppositional mechanisms built into a comprehensive analysis that accounts for both the various interpretations of *and*-sentences as well as those of other types of sentences involving similar interpretations. This account is a specific part of a unified solution to the knotty problem of different manners of conveying causal and temporal relations both with connectives and also with juxtaposed sentences. It is formulated within the Relevance Nomological Model which provides a general framework for the analysis of causal constructions such as the connective *because* and *why*-questions.

Keywords Causality · Temporality · *and* · Presuppositions

1 The puzzle of causal and temporal uses of *and* and juxtaposed sentences

One problem linked to the relations attached to *and* in natural language was pointed out by Grice (1989), who observed that natural language *and* can go beyond its rather meagre logical meaning as illustrated by his famous example:

(1) a. He took off his boots and got into bed.
b. He got into bed and took off his boots.
c. $P \wedge Q = Q \wedge P$.

Grice noticed that the meaning of *and* in (1)a and (1)b cannot be reduced to its logical counterpart $\wedge$ shown in (1)c. In particular, the commutativity of logical conjunction is not attested in many cases in natural language. Grice's strategy to preserve the logical sense of *and* consisted in moving the supplementary meaning material to pragmatics, i.e. non-truth-conditional aspects of meaning.

In addition to the basic problem exposed in (1), any theory aiming at explaining the behaviour of the connective *and* faces at least two puzzles involving the temporal and causal interpretations of *and*.

First, it seems that the possibility to infer causal interpretations of *and* is tightly related to the temporal order of events: causal interpretations of *and*-sentences are only possible in the order matching the temporal sequence of events, i.e. the iconic order, while the non-iconic order i.e., the order that is inverse to the temporal one, blocks them. Perhaps the best illustration of this problem comes from Bar-Lev and Palacas, who observed that when *and*-sentences are compared to equivalent juxtaposed sentences, no such restriction on causality is attested for juxtaposed sentences (Bar-Lev and Palacas 1980), as it is demonstrated in (2).

(2) a. Mary ate too much. She got sick. <iconic>
b. Mary ate too much **and** she got sick.
<iconic> **+** causality
c. Mary got sick. She ate too much. <non-iconic>
d. Mary got sick **and** she ate too much.
<non-iconic> − causality

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It is clear that causal interpretations are possible in (2)a-c, but not in (2)d where *and* appears in a sentence with non-iconic (consequence-cause) order of events.

However, a full explanation of the causal behavior of *and* should also take into account another puzzle—which in fact is a counterexample to the first one—the so-called Horn counterexample. It has been observed (cf. Carston 1993) that there are some particular contexts where the causal interpretation of *and* emerges in the 'wrong' (i.e. the non-iconic) order:

(3) Well, John fell, **and** it was slippery.
<non-iconic> + causality

(3) says that John fell and that it was slippery and that there is the causal relationship between the two events. Citations of Horn's example usually come with a word of caution saying that the example sounds a bit bizarre, and that its acceptability necessitates a special prosodic contour and a comma before the connective *and*. Nevertheless, (3) is a sentence that a great majority of English native speakers accepts as felicitous. Thus, a convincing analysis of this example, i.e. an analysis which explains why it is acceptable but also why it sounds strange somehow, should be provided. In sum, the question is to know why it is possible to convey causal relations with *and* only when the temporal order of events is preserved yet at the same time, a causal interpretation with the non-iconic order is also admitted in some particular cases.

There is still disagreement on how these phenomena should be explained. Grice's initial suggestion to treat them as generalized conversational implicatures has been reconsidered in post-Gricean frameworks (in terms of explicatures) (Sperber and Wilson 1986; Carston 2002), in neo-Gricean accounts (as defaults) (Levinson 2000; Asher and Lascarides 2003) and within the discourse relations approach (Zeevat and Jasinskaja 2007). Section 2 will offer a quick overview of these proposals and will show why they cannot fully explain the whole knotty problem of causal and temporal interpretations of *and*-sentences and juxtaposed sentences.

In Sect. 3, we provide an explanation of the two puzzles using the same presuppositional mechanisms of conjunction, and in particular, the fact that the projection properties of conjunction are not symmetric (Chierchia and McConnell-Ginet 1990). This is part of a wider model, the Relevance Nomological Model, developed for the analysis of different causal constructions, such as *because*-sentences and *why*-questions (Blochowiak 2014).

More particularly, as shall be demonstrated, a crucial role in the problem of temporal and causal interpretations of *and* is played by a generic type of non-accidental generalizations over events (e.g.: *If it is slippery, then normally one falls*) contained in the common ground. Such generic statements come into play in the procedure of choosing the propositions to be attached to the utterance as the pragmatic presuppositions related to *and*, and, as we will argue, they have the power to filter out the presuppositions normally attached to the conjuncts, either allowing for or blocking causal interpretations.

In sum, the new point put forward by the present approach is that temporality matters for causality of *and* only because the temporal order of events has to be preserved in the non-accidental generalizations which are used when choosing the pragmatic presuppositions related to *and*.

2 Traditional Explanations

This section presents a subset of different solutions that have been proposed to tackle the question of causal and temporal uses of *and*. First, the traditional Gricean view will be presented in Sect. 2.1. Second, the proposal of Relevance Theory which considers these additional meanings as explicatures will be sketched (Sect. 2.2), followed by two default approaches in Sect. 2.3 (Levinson 2000; Asher and Lascarides 2003). Finally, Sect. 2.4 will present Zeevat and Jasinskaja's proposal to treat *and* as a weak additive particle (Zeevat and Jasinskaja 2007).

2.1 The Implicature View

Traditionally, the basic semantics of *and* is assumed to be constituted of the truth-functional meaning of the logical connective $\wedge$, while the temporal or causal interpretations of natural language *and* are seen as Gricean generalized conversational implicatures. A cooperative speaker is considered to be obeying one of the sub-maxims of manner, namely the *Be orderly!* maxim. Given this assumption, the hearer infers that things happened exactly in the order in which the speaker narrated them. What supports the generalized conversational implicature view with respect to *and* is the fact that the proposition pragmatically inferred (i.e. implicature) (4)b can be cancelled as in (4)c.

(4) a. John took a shower and had a coffee.
b. John took a shower and *then* had a coffee.
c. John took a shower and had a coffee but not in this order.

As it seems, the *sine qua non* condition for the causal interpretation of *and* is the correct order of events described in conjuncts, that is, the iconic order achieved via the maxim of manner, if one accepts the implicature view of *and*. First, the hearer infers the correct order and only after, he can start to consider other possible links between the events, one of them being a causal relation. Therefore, it

seems that under the implicature view, we deal in fact with a double-step derivation. Let us examine this option with the example in (5).

(5) Mary pushed Max and he fell.

First Step Derivation: Maxim of Manner

The hearer infers that the events described happened in the order narrated by the speaker (here the temporal order), assuming that the speaker respected the sub-maxim of manner: *Be orderly!*

Second step derivation: Maxim of Quantity

Once the hearer has inferred the temporal order (which matches the order of events in the reality), he can further assume that the speaker is still cooperative and, thus, she is maximally informative. The hearer knows that there is a possibility to see the events described by the *and*-conjuncts as causally related. The hearer further assumes that if the speaker is still cooperative and, in particular, if she obeys the second maxim of quantity (*Do not make your contribution more informative than is required!*), then given the possibility of establishing a causal relation between the events, she would have to report that the events are not in a causal relation if this were the case according to her. Hence, if the reported events were not causally related, the speaker would have to say so. Therefore, the events described must be in a causal relationship.

However, there is an argument against the implicature view of the enriched meaning of *and*. Implicatures are not supposed to enter the calculation of the truth-conditions of an utterance, as can be observed in (5). Indeed, the temporal and causal interpretation of (5) is not necessary to establish its truth-conditions, since all that is needed for (5) to be true is that both conjuncts be true. Yet, some more complex examples reveal problems for the implicature view. As some authors convincingly argue (cf. Cohen 1971; Carston 1988; Wilson and Sperber 1993; Moeschler 2000, 2010), the temporal and causal meanings of *and* turn out to have an effect on the truth-conditions of utterances with the connective *and*.

(6) a. It is always the same thing in the parties, nobody talks to me and I get drunk or I get drunk and nobody talks to me.
b. $(\neg P \wedge Q) \vee (Q \wedge \neg P)$.

(7) a. What happened is not that Peter left and Mary got angry, but that Mary got angry and Peter left.
b. $\neg(R \wedge S) \wedge (S \wedge R)$.

(6) is a non-informative statement and (7) is a contradiction from a logical point of view. However, from a pragmatic point of view, (6)a and (7)a certainly have a non-vacuous meaning. This means that the truth of the conjuncts alone is not enough to establish the truth-conditions of these complex utterances with *and*, suggesting that the temporal and causal relations have to be taken into account in the calculation of their truth-conditions. If it is so, then these additional meanings cannot be seen as implicatures, at least not in the traditional sense, in which they do not affect the truth-conditions of the utterances they are linked to.

Now, putting aside the problems of truth-conditions, although it is possible to figure out a Gricean procedure to get the whole interpretation,[1] one ends up having at least two different ways to derive the temporal and causal interpretations of *and*: the one for simple cases as in (5), where obeying the sub-maxim of manner together with the maxim of quantity is required, and another for complex cases as in (6) and (7), where a violation of the maxim of quantity and quality is required respectively. Moreover, one should still find another explanation for the cases of juxtaposed sentences where temporal and causal interpretations are freely available with no connective whatsoever (cf. (2)a–c). All this shows is that the traditional Gricean framework is able to provide a separate solution to each of these phenomena. However, from a general methodological point of view, having several different procedures to explain the nature of very similar phenomena is not economical, especially if a single solution unveiling a common mechanism can be conceived.

2.2 The Explicature View

In the framework of Relevance Theory, the problem under discussion is solved by treating the temporal and causal enrichments of *and* as explicatures. In a nutshell, according to Relevance Theory, in order for an utterance to be evaluable as true or false, a passage from logical form, taken here to mean a sequence of concepts composing the sentence, to the propositional form of the utterance, is required. To arrive at a propositional form of the utterance several types of pragmatic enrichments, such as reference identification or ambiguity resolution, are demanded. In Relevance Theory, the notion of explicature was introduced to deal with the phenomena which, even if partly pragmatically inferred, are necessary for the evaluation of the proposition in terms of truth and falsity.

The proponents of Relevance Theory claim that since temporal and causal dimensions affect the truth-conditions of utterances with *and*, they must be part of the

[1] It is because (6) is not informative and violates the maxim of quantity that an enrichment of the semantic content is demanded through a conversational implicature. And it is because (7) is contradictory and violates the maxim of quality that an enrichment of the semantic content is demanded through a conversational implicature. Thanks to an anonymous reviewer for the suggestion.

propositional form of these utterances, that is, they are explicatures.

Under the explicature view, things are considered in a way that is very similar to the implicature account although both the temporal and the causal relationship would be derived via one single principle of relevance. The speaker makes her utterance optimally relevant if (i) she says things in the correct (i.e. iconic) order (in which case the hearer avoids making an effort to recover the correct order of events), and (ii) she takes into account all the information that is relevant for the interpretation of utterances and in particular, the conceptual rules (here, the causal one) that are mutually known to the speaker and the hearer.

Therefore, assuming these two points, it is quite easy to see how the temporal and possibly causal interpretations come about. If the speaker narrates things in the correct order (i.e. the iconic one) and the causal relation can be inferred, the causal and temporal relations are inferred at the same time via the principle of relevance and added as explicatures to the propositional form of the utterance with *and*.

However, the same problem pops up again with juxtaposed sentences, where the speaker does not present things in iconic order, but the hearer still recovers very easily the temporal and causal relations. In order to explain this phenomenon, Relevance Theory considers that the case of juxtaposed sentences is quite different from *and*-conjoined ones because the juxtaposed sentences constitute two different processing units and each of them calls for its own optimal relevance. The causal relation between juxtaposed sentences is seen from this perspective as a case of implicature. Nonetheless, one could object that temporal and causal relations in juxtaposed sentences are not linked only to the first or only to the second conjunct but that they point to the relationships between the two. Moreover, as it was already mentioned, all these phenomena seem to be very similar after all, and the best explanation should find the common pragmatic mechanisms behind them.

2.3 The Default View

Two other classical proposals, the segmented discourse representation theory (SDRT) (Asher and Lascarides 2003) and the *I-Heuristics* view (Levinson 2000), explain temporal and causal interpretations by default mechanisms.

In SDRT, temporal and causal interpretations correspond to the discourse relations of *Narration* and *Explanation*, respectively. The discourse relation that is less specific is claimed to be the default one. Since the less specific between the two is *Narration* it comes out as the first option, i.e. the first discourse relation to be applied while *Explanation*, which is more complex, will come second. In other words, the temporal relation is the first one tried out by the hearer and the causal relation may come and superpose itself on the temporal one.

The algorithm for the interpretation of *and* proposed by Levinson (Levinson 1983: 146) goes as follows:

(8) a. Let be p and q. Try to interpret it as:
b. "p and then q"; if it is possible, try:
c. "p and so q"; if it is possible:
d. "p, and p is the cause of q".

It seems that in this type of cases the implicatures of quantity (or *Q-Implicatures*) and the informative implicatures (*I-Implicatures*) are in conflict, since the speaker is supposed to give the strongest information but, in fact, she gives the weak information and the hearer has to infer the strongest one. This problem led Levinson (cf. Atlas and Levinson 1981; Levinson 1983, 1987, 2000) to work out an alternative development of the maxims of Grice (*I-Heuristics*). In particular, Levinson (2000: 114) postulates the existence of a Principle of Informativeness (or *I-Principle*) (cf. Atlas and Levinson 1981: 40–41 for a more formal definition).

(9) I-Principle
Speaker's maxim: the maxim of Minimization. "Say as little as necessary."
Recipient's corollary: the Enrichment Rule. Amplify the informational content of the speaker's utterance, by finding the most specific interpretation.

In accordance with the Principle of Informativeness, the speaker can make a weak assertion that implicates the stronger interpretation, as long as it is compatible with the world knowledge of the participants in the conversation. In this sense, the different interpretations of *and* as in (10)b, c are the result of *I-Principle*, and, thus, correspond to *I-Implicatures*, also called conjunction buttressing (Atlas and Levinson 1981).

(10) a. Max turned the key and the engine started.
b. Max turned the key and then the engine started.
c. Max turned the key and as a causal result the engine started.

Summing up, both default approaches assume that the temporal interpretation constitutes the first step and the eventual causal interpretation the second step in the understanding of *and*-conjoined sentences. Therefore, it is again difficult to see how such approaches would handle cases of non-iconically juxtaposed sentences.

Moreover, the idea that is present in all of the approaches we have seen up to now and according to which the temporal interpretation is a necessary first step in the recovery of a causal relation is not viable from a cognitive point of view. The results of experimental studies involving

reading time measurements show this clearly, as we will see in Sect. 3.7.

2.4 *And*—An Additive Particle

Another account of *and* can be found in the work by Zeevat and Jasinskaja (2007), which considers *and* as having the basic semantics of an additive particle such as *also*, and derives its causal use as an interaction between questions arising from the common ground and answers to these questions. In this optic, *and* is seen as being compatible with questions (e.g. *why*-questions) related to some discourse relations (e.g. *Explanation*).

Two questions remain with respect to Zeevat and Jasinskaja's approach. First, if causal readings of *and* result from *why*-questions presented in the discourse, one could ask why such questions do not receive their canonical answers, namely, sentences with *because*. Second, Zeevat and Jasinskaja do not make a clear commitment as to the status of temporal and causal interpretations of *and*, in particular with respect to the possibility of their cancelling. They see *and* as an additive particle, which would mean that the property of 'addition' is inscribed in its semantics, and possibly participates in the calculation of its truth-conditions. If my interpretation of their theory is correct, the possible cancellability of relations that *and* can convey still remains a question.

3 A Relevance Nomological Model approach

The solution proposed in this paper is part of a broader framework, the Relevance Nomological Model, which aims at analyzing connectives, especially *because*, and *why*-questions (cf. Blochowiak 2014). Its two main technical notions are *laws* and *speaker's background*.

In a nutshell, the main idea of the Relevance Nomological Model is that causal interpretations of discourse in general are possible because of the knowledge of law-like regularities that speakers have in their backgrounds.[2] Such law-like regularities, technically called *laws*, are comprised predominantly of 'everyday' or 'folk-science' laws or rules, but they also contain 'real' laws of science. We assume that in a vast majority of cases, they do not hold universally (in the logical sense of the universal quantifier), as they usually admit all sorts of exceptions. Given the speaker's nomological knowledge, she is aware whether some event can be a priori seen as a regular event, i.e. one that can be an instantiation of a non-accidental generalization. It should be underlined here that although the problems caused by the fuzziness of 'everyday' laws and especially the issue of their formal treatment are important, they will not be addressed here due to lack of space. One formal proposal treats them within a larger approach analysing generic statements (Carlson and Pelletier 1995). In particular, a specific quantifier *Gen* is defined to grasp the meaning of the word *normally*, that is, the conditions that have to be fulfilled in order for a generic statement to be true (Chierchia 1995; Greenberg 2002, 2007). Now, it should be clear that the theoretical choice of the treatment of 'everyday' laws is left open so that one can choose one's favourite theory of causality and use it instead. However, what cannot be removed from the model is the empirical fact that people do apply such fuzzy laws in their everyday reasoning, and this is reflected in their use of language.[3]

The second fundamental concept of the Relevance Nomological Model is the notion of speaker's background. Technically, speaker's background is defined as a *structured* set of propositions describing all kinds of speaker's knowledge about the world: it encloses all simple factual knowledge described by particular propositions and all law-like knowledge described by non-accidental generalizations predominantly expressed as generic statements. The particular propositions are in turn divided into propositions describing regular (non-random) eventualities and random ones. It is worth mentioning here that stocking the knowledge of law-like regularities is highly advantageous from a cognitive point of view as it makes collecting a huge number of singular facts inferable from laws unnecessary and allows making predictions.[4]

[2] The notion of laws is akin to contextual assumptions from the Relevance Theory. One difference is that contextual assumptions cover a broader range of phenomena as they also enclose singular propositions in addition to general rules. Another difference is that the Relevance Nomological Model takes into account the specific generic nature of laws involving exceptions and *ceteris paribus* conditions (although in this paper, a simplified conditional version of laws will be used). Last but not least, as we will see, treating laws as presuppositions offers better tools allowing for a more fine-grained analysis of an interaction of laws from the speakers' backgrounds with the developing conversation.

[3] See also Bromberger (1966, 1992) for a formalization of laws of science that takes into account exceptions in predicate logic and Blochowiak (2014) for the extension of Bromberger's view to 'everyday' laws in a Possible Worlds Semantics framework. Nevertheless, in order to avoid unnecessary complications, I will here use simple conditional sentences as a first and very rough approximation (cf. also footnote 8).

[4] There is quite a big bulk of empirical evidence showing that the capacity of collecting of the knowledge of regularities in general, and causal ones in particular, is already actively present in young children (Spelke 1994, *inter alia*) and, of course, even more importantly in adults (see Gopnik and Meltzoff 1997 for the 'Theory theory' approach). As children grow up, the skill of recognizing regularities of all sorts becomes more and more sharp. An interesting point observed by Piaget (1948, 1959) is that under the age of 11, children are not quite able to differentiate between events that are random and events that are not, i.e. the ones that admit a principled explanation. What is important for the present proposal is that the differentiation between random and non-random events is operative at some point of human development. So, some events can be seen by competent speakers as a priori non-random (for instance, one can imagine many possible causal scenarios for the event of John's falling in accordance with multiple laws one knows involving fallings) and some others as

From a theoretical point of view, the speaker's background is a tool that aims at modelling how and what kind of knowledge is stored in the speaker's mental repertoire and how it combines with the backgrounds of other participants in the conversation. As almost all approaches to background claim, there must be some common part in the backgrounds of the participants of the conversation to allow them to interact (cf. Stalnaker's common ground (Stalnaker 1974) and context set or context in Relevance Theory). All this knowledge which is rarely overtly stated but which is necessarily presupposed so that speakers' utterances make sense comes from their backgrounds (conversational background in Kratzer's terminology (cf. Kratzer 2012)).

According to the Relevance Nomological Model, causal interpretations of discourse are tightly related to laws contained in speakers' backgrounds and different causal constructions (for example different connectives) make use of this information in a manner that is proper to them. For instance, as it has been demonstrated (Blochowiak 2014), *because* not only presupposes but also entails the existence of the appropriate law, which guarantees its causal interpretation,[5] while the causal interpretation of *and* is related to the presupposition triggered by the types of the event-conjuncts. These events are considered to not be random, which coerces the participants of the conversation to find and 'push' an appropriate law into the common ground with a causal interpretation of *and* as the result.

3.1 The Presuppositional View

The propositions contained in speakers' backgrounds may play the role of pragmatic presuppositions in some contexts and this is also the case for the temporal and causal interpretations involved in our puzzles (see Sect. 1).

First developed by Stalnaker (1974), the notion of pragmatic presupposition pertains to a set of propositions relevant to the conversation that are mutually known and shared by the participants of the conversation. A pragmatic presupposition is a proposition that is contained in the common ground and is associated with the utterance of some sentence in a given conversation. More precisely, a proposition p is a pragmatic presupposition associated with an utterance of a sentence s by a speaker a in a context c if a believes that p and also believes that the hearer b believes that p and in addition b believes or recognizes that a has these beliefs.[6] This means that for a given utterance of a given speaker, the set of pragmatic presuppositions is a function of context and conversation. Nevertheless, pragmatic presuppositions are claimed to be a necessary part of the truth-conditions of an utterance they are associated with.

For the thorny problem of diverse interpretations of connectives and juxtaposed sentences (temporal, causal and other), the crucial role is played by the laws that are contained in the speakers' backgrounds and are 'pushed' into the common ground when the appropriate sentence is uttered. Now, let us see in more detail how this comes about.

3.2 Laws as Presuppositions Triggered by Types of Events

As we saw at the beginning, causal interpretations are available in all configurations of juxtaposed sentences and *and*-sentences except for *and*-sentences with a non-iconic order of events (corresponding to consequence-cause order) (cf. (2)).

Let us start by examining where the causal interpretations come from in simple juxtaposed sentences, as in (11).

(11) a. Max fell. Mary pushed him.
b. Mary pushed Max. He fell.

In both (11)a and b, the causal relation between the two events is inferable by the hearer. Yet, there is no single linguistic device, like for instance a causal connective, that would explain how the speaker arrives at a causal interpretation. So, what allows such an interpretation?

The participants of the conversation have somewhere in their general background a law saying that pushing causes falling. Now, an utterance of two sentences describing concrete events which can felicitously fit the law brings this law into the common part of the speakers' backgrounds. More formally, the proposition expressing such a law enters the set of propositions relevant to the current discussion, i.e. the conversational background. From this moment on, the law is in the set of presuppositions (that is things taken for granted and relevant to the particular discussion).

Now the question is to know what could possibly trigger such a presupposition, knowing that there is no single linguistic device that points to it. The only answer that seems to be acceptable is that the trigger of such a

Footnote 4 continued
random (e.g. one cannot imagine a possible cause for the event of John's winning in the lottery, as winning events (excluding the possibility of cheating) are not governed by causal laws).

[5] Or another type of grounding type of relation (cf. Blochowiak 2014). In the remaining text I will use the term *causal* to represent all sorts of grounding relations which could be involved.

[6] One should note that the belief that p does not necessary mean true beliefs but could refer to speakers' purport to believe that p for the sake of the conversation at hand (cf. Chierchia and McConnell-Ginet 1990 p. 360).

presupposition is precisely the type of events described by the propositions expressed in juxtaposed sentences.

As for now, we have the law which is presupposed but we still do not know how the speaker gets the causal interpretation of the particular events described by the juxtaposed sentences. In fact, and this is the essential point of this approach, the presupposition of the applicability of the law of a causal type *entails* the causal interpretation. In our case, the presupposition that pushing causes falling, together with the propositions describing the event of Max's falling and the event of Mary's pushing Max, entails that Mary's pushing Max *caused* Max's falling, as is summarized in (12) below.

(12) a. Max fell. Mary pushed him. OR Mary pushed Max. He fell.
b. presupposition of the causal law: Normally if x pushes y, then y falls.
c. (12)a and (12)b entails (12)d.
d. Mary's pushing Max caused Max's falling.

The causal interpretation with juxtaposed sentences is possible without restrictions on the order (iconic and non-iconic) because there is no lexical item that would set additional constraints on the interpretation of the whole discourse and the direction of causality (which event caused which event) is established by the recognition of the fact which event is an instantiation of the antecedent and which one of the consequent of the relevant law.

As it is well known, the inference of a causal relation when the configuration of juxtaposed sentences is involved can be cancelled. In the case of cancellation, the simple mechanism of presupposition failure is operative. A given law is *presupposed* to be applicable to the described situation, but, as it happens, this law is not at stake there. Therefore, the causal interpretation is not available anymore.[7]

[7] One important note about the way laws are applied by speakers in their use of language is worth pointing out here. Our canonical pushing-falling example is an example of a (quasi) direct causality. However, in many cases, speakers do not provide descriptions of the events that are related by a direct causal relation, but refer to events that are either further in a causal chain of events or that are only necessary conditions for causality, letting the hearer infer the events that have not been explicitly mentioned. For instance, imagine the following example: John's boss has received an anonymous letter and John has been fired. It is clear that there is no causal law depicting a relation between the boss receiving an anonymous letter and the firing of an employee. What is suggested here is that the anonymous letter contained some negative (bad enough) information about the employee that prompted the boss to fire him. Thus, it is clear that the causal rule tacitly evoked here by the speaker and recovered by the hearer is something like: If the boss acquires negative (bad enough) information (by any means, anonymous letters included), then he is inclined to fire the employee. I thank an anonymous reviewer for bringing this kind of examples into my attention.

Sentences with *and* that can potentially receive a causal interpretation, can get it by exactly the same mechanism as juxtaposed sentences do, i.e. the type of events described triggers the presupposition about the existence of an adequate causal law and its applicability to the situation at hand. However, *and*-sentences are obviously different from juxtaposed sentences because they contain an additional lexical item—the connective *and*—which further constraints the interpretation of *and*-sentences. As we will see in the next section, the blocking of the causal interpretation in one order and allowing it in another is due to some more general properties of the conjunction related to the projection of presuppositions.

3.3 Temporal and Causal Uses of *and*—A Pragmatic Presupposition View

Before we continue with the discussion of causal *and*, I would like to provide more evidence for a presuppositional view on laws related to juxtaposed sentences and *and*-sentences by contrasting them with an entailment-based view on laws related to *because*-sentences.

According to the solution which I have proposed elsewhere, the existence of laws is inscribed in the semantics of *because* (cf. Blochowiak 2014). This is tantamount to saying that the presence of relations (causal or another type of grounding relation) between events linked by *because* is entailed by *because*-sentences, what is summarized in (13).

(13) a. John fell because Mary pushed him.
b. entailment and presupposition: Normally if x pushes y, then y falls.
c. entailment: Mary's pushing John caused John's falling.

So, *because*-sentences entail two things: (i) the existence of a relevant law and (ii) the subsistence of the relation inherited from the law. Each of these entailments is important.

In the majority of cases, the speaker and the hearer have knowledge about different causal laws, and the uttering of a sentence with *because* will not teach them (in particular the hearer) the existence of a new law, but only the fact that in a particular situation, a particular causal relation subsists *in accordance* with a such and such causal law.

Now, why do we need the entailment of laws in the case of *because*? Would their presupposition not be enough as in the case of juxtaposed sentences and *and*-sentences? The presuppositions of laws with *because* would not be enough as there are cases where the knowledge of a given law is not shared by speaker and hearer but nevertheless the utterance of the *because*-sentence guarantees the causal interpretation. For this purpose, consider the following example. You may know that your friend John has an

intolerance of gluten and you may also know that he has intestinal permeability (i.e. a leaky gut) but you may not know that there is by now a well established causal relationship between the two states, as (14) makes explicit.

(14) John has an intolerance of gluten because he has a leaky gut.

Hence, if a truthful person (say, a doctor who is a specialist on the subject) utters (14) and if you accept it as true, then you have to accept the existence of a causal law (leaky gut provokes intolerance of gluten) and you will add this law to your background. In this sense *because* not only presupposes but also entails the existence of a law that makes the causal relation (or another type of grounding relation) obligatory with *because*.

On the other hand, if you consider *and*-sentences, they do not entail causal laws. Therefore, their causal interpretation, in the absence of causal laws in the common ground, is part of the hearer's responsibility and may be cancelled as a result of a presupposition failure. Consider the following example which goes back to February 2013 when two cosmic phenomena occurred. First, there was an impressing 'rain' of meteorites in the Siberian town of Chelabinsk, and second, a quite big asteroid called Duende passed very close to the Earth. Let us assume that a speaker utters (15).

(15) The asteroid Duende passed near Earth and a meteor exploded over Chelabinsk.

It is possible to imagine that the hearer of (15) concludes that there was a causal relationship between the two events although he does not know the relevant law (but he just guessed that such a law exists via the mechanism of presupposition accommodation). However, there was in fact no causal relationship whatsoever between these two phenomena. It was just by pure chance that they occurred close in time one to the other. Hence, a *because*-sentence will be simply false in this context. So, as this example demonstrates with the use of an *and*-sentence (and this is also applicable to juxtaposed sentences), the causal interpretation that the hearer may infer can originate from his erroneous assumption about the existence of some causal law, and thus, this interpretation is the responsibility of the hearer, the speaker not being committed to endorse it.

Summing up, our examples show that the existence of laws is indeed presupposed by *and*-sentences (and juxtaposed sentences), and it is not only presupposed but also entailed by the sentences with *because*, which explains the fact that the presence of causal relations is optional and can be cancelled with *and* (the presupposition of the applicability of a concrete law to the situation at hand may fail, i.e. there are cases of presupposition failure) while the causal relation is obligatorily present with *because*. Given the fact that pragmatic presuppositions, although inferred pragmatically, are claimed to be part of the truth-conditions of a sentence, this solves the problem of the persistence of causal relations in the truth-conditions of sentences with *and*. Since the causal relations in *and*-sentences and juxtaposed sentences follow from the presuppositions about laws, they survive as long as these presuppositions do not fail.

3.4 Projection Properties of Conjunction

In this section, I will propose a solution for the possible causal interpretations of *and* that is based on the projection properties of conjunction. A solution for analyzing temporal interpretations will come out naturally from the solution for causal interpretations and will be discussed right after.

As it was demonstrated in Chierchia and McConnell-Ginet (1990), the behavior of conjunction with respect to eventual presuppositions carried by its conjuncts is not symmetric. This is because conjunction, together with *or* and *if…then*, behaves like a presupposition filter.

Hence, although in simple situations it seems that the presuppositions carried by the conjuncts are both projected to the complex sentence with *and* (as in (16)), this is not always the case.

(16) a. Mary didn't suspect that John was at home and Sally knew that John was at home.
b. John was at home.

Here are the relevant examples taken from Chierchia and McConnell-Ginet (1990: 366) illustrating the filtering properties of conjunction.

(17) a. Keith has three children, and all Keith's children are asleep.
b. Keith has some children.

The second conjunct of (17)a presupposes (17)b but this presupposition is in fact entailed by the first conjunct of (17)a. For this reason, we say that the presupposition of the second conjunct is filtered out since it does not put any additional constraints on the interpretation of the whole sentence. However, if the order of conjuncts changes, the projection properties of *and* are affected.

(18) All Keith's children are asleep, and Keith has three children.

Indeed, as Chierchia and McConnell-Ginet observe, uttering (18) in a context where the presupposition (17)b is not already in the common ground of the conversation would be awkward (indeed if it would be uttered 'out of the blue', the mechanism of *accommodation* would add such a proposition to the common ground).

What these examples show is that the projection properties of the conjunction are not symmetric, that is, the complex sentence *p and q* is not a sum of the presuppositions carried by the sentence *p* and the sentence *q*, each one taken separately from another.

To better grasp what the projection properties of the conjunction are, we should note that the presuppositions linked to the conjuncts seem indeed not only to interact with one another but also with the propositions that are in the common ground. Consider another example discussed in Chierchia and McConnell-Ginet (1990: 366):

(19) a. If Keith is married to Linda then he has children.
b. Keith is married to Linda, and all his children are asleep.

In a simple situation, uttering (19)b would presuppose (17)b, i.e. that Keith has some children, this presupposition being carried out by the second conjunct of (19)b. Now, imagine that the proposition (19)a is contained in the common ground. In this situation, uttering (19)b does not have the same presuppositions anymore. In fact, the presupposition of the second conjunct of (19)b is entailed by the proposition from the common ground (19)a together with the first conjunct of (19)b. By this mechanism, the presupposition of the second conjunct is filtered out, and that is why (19)b no longer presupposes (17)b.

Given these facts, the projecting properties of conjunction can be generalized as follows:

(20) Presuppositional properties of conjunction (Chierchia and McConnell-Ginet 1990: 366)
[…] *p and q* uttered in a context inherits all the presuppositions of both *p* and *q* except for any presuppositions of *q* that are contextually entailed by *p* (that is, entailed by *p* together with the propositions already in the common ground).

3.5 Causal Interpretations of *and*—As a Result of Filtering of a Presupposition

In order to provide an explanation for the initial puzzle of the causal interpretations of *and* that are only possible in one order, namely, the iconic order (reflecting the direction of implication in laws), I would like to postulate a mechanism which filters out presuppositions.

As we saw in the previous section, *and* has the power to filter out the presuppositions of its second conjunct with the help of the presuppositions of its first conjunct and some other pragmatic presuppositions that are already in the common ground (i.e. in the common background of the speakers). Now, let us determine the eventual presuppositions that are typical components of our causal examples.

What could be a presupposition of (21)a below? As we saw in Sect. 3.2, (21)a describes a specific kind of event that one may arguably suppose not to be random (people do not normally fall without a reason). What does it mean for an event *e1* to not be random? This means that there is a presupposition stating that there was another event *e2* that caused *e1*. In other words, the sentence (21)a, describing a non-random event, carries a presupposition in the form of a proposition describing the existence of another event causing the former one. This presupposition may be stated in several forms, but basically two types are identifiable: (i) the presupposition is an existential closure of formula as in (21)b or c, or (ii) the presupposition has the form of an unanswered question, as in (21)d or e.

(21) a. Max fell.
b. Something happened that made Max fall.
c. There exists an event e2 that made Max fall.
d. What happened that made Max fall?
e. Why did Max fall?

Now what about the other component of typical causal examples? First, (22)a below entails (22)b, c and d. But in addition to this, and more interestingly, the event of Mary's pushing Max may be seen as non-random in the very same spirit as the event of Max's falling. If one supposes (and it seems reasonable to do so here) that Mary has some reason or motive for pushing Max, then it is enough to see this event as potentially non-random. The potential non-randomness of the event of Mary's pushing Max engenders similar types of presuppositions as in the previous example (22)e, f, g. The first type of presupposition is an existential closure of formula (22)e, and the second type is in the form of an unanswered question (22)f, g (note that it is not necessarily a question under discussion).

(22) a. Mary pushed Max.
b. Somebody pushed Max.
c. Mary pushed somebody.
d. Mary did something to Max.
e. There exists an eventuality e2 (reason or motive) that made Mary push Max.
f. What happened that made Mary push Max? (What was the reason of Mary's pushing Max?
g. Why did Mary push Max?

Summing up, the propositions expressed by (21)a and (22)a have both presuppositions related to the fact that the events they describe can be seen as non-random: these presuppositions may have the form of an existential closure and/or an unanswered question.

Now, recall that the causal laws are presupposed, that is, they are brought to the common ground by events described in *and*-sentences or juxtaposed sentences. For our

purposes, the logical form of such laws can be seen as a simple universal conditional.[8] So, to avoid unnecessary complications, we will consider the simple universal conditional version of our causal law in (23)a together with the conjunctive sentence with iconic order in (23)b.

(23) a. If x pushes y, then y falls.
b. Mary pushed Max and he fell.

Keeping in mind the presuppositional properties of conjunction (cf. (20)), it is possible to analyze this example along the following lines.

The second conjunct of the proposition expressed by (23)b presupposes some (or maybe even all) propositions expressed by (21)b-e, that is, something like: there exists an event, and we don't know which one, that caused the event of Max's falling. However, the presuppositions of the first conjunct together with the law in (23)a allow the saturation of the unknown event variable so that the presupposition of existence of an unknown event vanishes. In other words, the presupposition that there was some unknown event *e2* that caused the falling of Max is not actual anymore, as it has been filtered out by the first conjunct and the law from the common ground. As a consequence, we obtain the causal reading of *and*. If we consider now the whole situation in terms of presuppositions as questions (21)d, e, then the presupposition in the form of an unanswered question disappears because the question has been answered through the first conjunct together with the law from the common ground.

Therefore, in analogy to (19), we can say that we deal here with presupposition filtering. The causal interpretation of *and* comes about when the presupposition linked to its second conjunct is filtered out.

Let us now see what happens when we switch the conjuncts around, obtaining the 'wrong' order for causal interpretation. Consider once more the law in (23)a, repeated here in (24)a, together with a sentence presenting the non-iconic order of *and* in (24)b.

(24) a. If x pushes y, then normally y falls.
b. Max fell and Mary pushed him.

The presupposition of the first conjunct is left untouched by the mechanism of filtering since the only presuppositions that can eventually be filtered out are the ones related to the second conjunct of *and* (cf. (20)). As we have seen, for our causal scenario most of the presuppositions (or entailments) of the second conjunct of (24)b (like (22)e, f, g) are not really interesting. The presuppositions that could potentially be of interest for a causal interpretation of *and* are the ones related to the possible non-random character of the described event (the existential closure of formula (22)e or an unanswered question (22)f, g).

Thus, the question is to know whether it is possible or not to filter out the presupposition of the second conjunct with the first conjunct and the relevant law so that the causal interpretation can appear. Obviously, the answer is that this is impossible to achieve, because the proposition expressed by the first conjunct instantiates the consequent of the law (and not its antecedent) that does not allow proper derivation of the conclusion.[9] Hence, the mechanism of filtering out of the presuppositions related to *and* together with an assumption of existence of laws in the common ground explains why and how it is possible to obtain causal interpretations of *and* in an iconic order, and also why the causal reading is blocked with the non-iconic order.

To sum up, the existence of a law in *and*-sentences is presupposed by the type of events described. Yet, as our puzzling examples show, the causal interpretation does not come out automatically. Usually, only one of the conjuncts describes the event which carries the presupposition of the occurrence of some unknown causing event. This presupposition may be seen as an existential closure of a formula, in which case it is filtered out by the process of saturation of variables, or equivalently, the presupposition may be seen as an unanswered question, in which case its filtering is done by the proper answering of the presupposed question.

3.6 Horn's Examples of *And*

The picture drawn in the previous section could be potentially destroyed by Horn's famous counterexample, in which the causal interpretation arises regardless of the 'wrong' order, that is, the non-iconic one, as in (25).

(25) Well, John fell, and it was slippery.

How to explain this fact? First of all, one should observe that, and all the scholars working on this kind of examples

[8] According to Carnap (1958: 36): "Most of the laws of science—physics, biology, even psychology and social sciences — can be phrased as conditionals. E.g. a physical law that runs something like 'if such-and-such a conditions obtains or such-and-such process occurs, then so-and-so follows' can be rephrased as 'for every physical system, if such-and-such conditions obtain, then so-and-so obtains'". I'm adopting Carnap's suggestion here and using conditional sentences as an approximation to formalize 'everyday' laws. One should nevertheless keep in mind that there are a lot of exceptions and *ceteris paribus* conditions which are not explicitly mentioned in such a simplified analysis.

[9] One could ask whether it would be possible to use one of the rules of non-monotonic logic (e.g. abductive reasoning) in order to derive the conclusion. I think that it is impossible because we do not deal in this reading of *and* with demonstrative uses of connectives. We will come back to this issue when we analyze Horn's example of *and* that, I claim, is indeed demonstrative.

note it, (25) is a special use of *and* which necessitates some particular prosody to be felicitously uttered. Before providing a successful analysis for this kind of example, we have to determine what this particularity points to exactly. I believe that the strangeness of this example is due to two distinct phenomena.

The first one is related to the use of *well*, which suggests that the sentence with *and* is a reaction to something which is contained in the common ground but with which the speaker of (25) does not agree. To illustrate this point, it is worth considering the following dialogue imagined by Zeevat and Jasinskaja (2007: 22).

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

So, what *well* points to is the fact that speaker *B* does not agree with *A*. This already explains to some extent the particular character of (25).

But there is also another observation that can further elucidate the particularity of (25). Indeed, contrary to the types of *and* examined before, we deal here with a demonstrative use of *and*. The Relevance Nomological Model makes a difference between two types of uses of connectives, namely, propositional and demonstrative ones. Briefly, in cases of demonstrative uses, connectives work on propositions and primarily signal relations that exist between propositions (and only secondarily do they concern the relations pertaining to the denotations of these propositions, e.g. eventualities). In other words, the connective is used to accomplish by the speaker a speech act consisting in an inference *hic et nunc*: Hereby, I am inferring *P* on the basis of *Q*. For instance, compare the two following *because*-sentences.

(27) a. The grass is wet because it rained.
b. It rained, because the grass is wet.

(27)a represents a propositional use of *because* since it corresponds to a simple description of a causal situation in which rain caused the grass to be wet. However, in (27)b the speaker does not describe a causal situation that happened but she infers an unknown cause (It rained) on the basis of a known consequence (The grass is wet), taking into account a law stating the causal relationship between wetness of grass and rain. As the demonstrative uses are speech acts, one of their characteristics is that they cannot be properly negated, which is shown in (28).

(28) a. It is not true that the grass is wet because it rained.
b. *It is not true that it rained, because the grass is wet.

So, (25) seems to be a demonstrative use of *and*, a fact that imposes a modification of its analysis with respect to the propositional type of *and* we have seen previously.[10] Before pursuing this analysis, we should make explicit some more intuitions about the interpretation of (25).

The first intuition concerns the speaker. We have the impression that in uttering (25) she does not fully commit herself to the existence of a causal relation between the events described by the propositions, but that she only suggests it, even though she does it strongly. As the dialogue in (29) shows, the speaker may finally retract herself, saying that the causal relation is just possible.

(29) A: You mean he fell just because it was slippery?
B: Well, I didn't say so. I just said that he fell and it was slippery.
So, I didn't say that there *is* a causal relation but there *might* be one.

Another intuition concerning the interpretation of (25) is that the speaker uttering it somehow coerces her interlocutor to accept or at least share with her the conclusion on the existence of such a putative causal relationship. Of course, given that the speaker herself may step back in her own acceptance of the existence of the causal relation, as we have seen, she can also step back in her gentle directing the addressee towards accepting the conclusion she wishes to put forward. These two intuitions should be both accounted for in terms of our Relevance Nomological framework, and in what follows, we will see how this can be properly done.

So, let us start by considering how (25) is explicable under the demonstrative view of *and* in examples of the Horn type. First of all, let us determine what a speaker who utters (25) commits herself to. Actually, all that she commits herself to is the truth of the two propositions: that John fell and that it was slippery. Now, what about the law saying that *if one steps on a slippery surface, one can fall*? As we have seen earlier, the existence of a causal law applicable to the situation is presupposed by the types of events described by the propositions. What is important to note is that the presence of a law and its applicability are not related to the presence of a conjunction, but are triggered by the descriptions of events themselves. As the dialogue in (26) suggests, the applicability of this law to the situation at hand is indeed presupposed, and I would even say that there was a proposition in the common

[10] It is interesting to observe that, beyond the connectives like *because* or *and* that admit both propositional and demonstrative uses, there exist connectives that seem to have only one type of use. For instance, *so* only has a demonstrative use, as was already noticed by Ryle (1950). Take his example. You can say *Today is Monday, so tomorrow is Tuesday* but you cannot properly negate it: **It is not true that today is Monday, so tomorrow is Tuesday*. This means that in using *so* the speaker makes an inference *hic et nunc*. In the Relevance Theory framework, Blakemore (1987) also makes a similar difference between truth-conditional and non-truth-conditional connectives.

ground stating that *John fell because it was slippery* (this proposition might have been said or just somehow implicated by *B*, that is, the speaker of (25)).

The first question is to know what exactly *A* wants to say in the dialogue (26). An obvious interpretation is that she tries to deny the existence of a causal connection via the observation: *John is an experienced climber*. What does this mean? Recall that everyday causal laws admit exceptions. And what *A* provided with her observation is a possible exception, according to which the law may not hold because people with special skills (e.g. climbing skills) are able to manage slippery surfaces better than average person. In other words, *A* provides an objection aimed at demonstrating that the law that we could think to be applicable to the situation in fact is not, and this because one of its exceptional clauses is actually applicable and suspends the applicability of the general rule of this law to the situation under discussion.

The second question is to know what exactly *B* does in dialogue (26). The intervention of *B* comes right after *A*'s objection concerning the application of a presupposed law, and it consists in reaffirming what is already known, namely that John fell and that it was slippery. By this reaffirmation, *B* aims at rejecting the objection provided by *A*, namely that John, an experienced climber, cannot fall on slippery ground. Even if *B* agrees that John is an experienced climber, for some (unsaid) reason she does not retain this information as a sufficiently valid objection. With this rejection, *B de facto* maintains the law (general rule) presupposed earlier as applicable to the situation, since the exceptional clause (which could a priori suspend the applicability of the law) cannot be retained (according to *B*).

Therefore, given *B*'s rejection of the objection provided by *A*, the law is again presupposed to be in force and therefore, the only available conclusion, the one suggested by *B*, is that there was indeed a causal connection between the events described. At the same time, due to *B*'s rejection of *A*'s objection, and in absence of any other objection, *A* is somehow coerced to accept the conclusion suggested by *B*'s demonstration.

If all this is correct, that is, if *and* in Horn's type of examples (at least in causal cases) serves to make inferences, then we should be able to construct the same kind of example by switching the conjuncts around. And indeed, this is possible as the dialogue in (30) demonstrates.

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

Summing up, a speaker who utters (25) and similarly a speaker who utters (30)B makes a demonstration. Firstly, by rejecting a possible objection to the applicability of the law to the situation at hand, and secondly, by reaffirming the truth of the two propositions which can be instantiations of the law, speaker *B* suggests that the conclusion imposing itself is indeed the correct one. And in the absence of any other objection, speaker *B* 'pushes' the hearer to also conclude the existence of a causal relation between the elements she has provided. However, since the major premise of the demonstration has the status of a presupposition, neither *B* nor *A* is forced to commit him- or herself to the truth of the conclusion of this demonstration. (31) summarizes the steps of the reasoning.

(31) *Presupposition triggered by events described in the conjuncts accepted by A and B:*
a. If x steps on a slippery surface, then x can fall.
Propositions provided as premises by speaker B and accepted as true by A and B:
b. It was slippery.
c. John fell.
Conclusion so far:
d. There is a causal relation between the slippery surface and John's falling.
Objection of A which, if correct, may suspend the applicability of the presupposed law:
e. John is an experienced climber.
Conclusion if objection is maintained:
f. John didn't fall because it was slippery or only because of this.
B rejects A's objection and the conclusion remains unchanged:
g. John fell because it was slippery.

3.7 Temporal Interpretation of *And*—A "Causality First" Proposal

Independently of the solution for causal interpretations of *and*, the problem of temporal relations that *and* can convey remains unsolved. As for now, it seems that temporal relations cannot be pragmatic presuppositions just because in majority of cases, temporal sequences of events do not constitute law-like dependencies.[11] Hence, it is hard to see what could possibly constitute the preexisting common knowledge for their interpretation.

What follows from the proposal presented in this paper is that the hearer first checks, so to speak, for causal

[11] It should be noted that there exist temporal regularities which are not causal. They describe for instance sequences of eventualities, where every preceding event is a necessary condition for the succeeding event (for example cooking recipes or operating instructions for machines like moving the car). They can also describe generally accepted temporal schemas like *taking off boots and going to bed* and private *ad hoc* temporal behavioral law-like schemas as for example: *John always drinks his coffee before he takes his shower*.

relations (or for any law-like relation). Why is it so? There is, of course, a cognitive answer to this question, according to which speakers, seen as agents acting in this world, are particularly sensitive to causality as the most important factor for the adequate understanding of the situations they evolve in (see Wilson and Sperber 1998 for the implication to Relevance Theory; Sanders (2005) for considerations of coherence and cognitive complexity in discourse). However, from the viewpoint of linguistic theory, the explanation needs to be developed in more detail. First of all, as we have seen, the traditional pragmatic explanations of these phenomena tend to consider the inference of the temporal order as a necessary first step for the inference of a possible causal relation.

A better pragmatic answer to this question, one that would take into account the cognitive considerations related to the processing of causality, should incorporate a very basic and uncontroversial observation: the participants of a conversation look for maximal information whenever they interpret utterances (they obey the maxim of quantity). And crucially, between the causal and temporal interpretations, the causal one is stronger, i.e. more informative since the temporal order of events is always inferable from the causal relation between them, but not vice versa.

For the sake of the theoretical game, one could nevertheless ask whether a "causal first and temporal second" interpretation could be possible within traditional views. After all, the supporters of the standard implicature view might subscribe to the claim about the informative primacy of causality over temporality.[12] This could work, if it wasn't for the fact that we would again run into the problem of diverse explanations for the same phenomena: for the iconic cases, speakers would be claimed to obey the sub-maxim of manner *Be orderly!*, whereas in the non-iconic ones, they would not. Even though, the supporters of the implicature view could decide to only keep the maxim of quantity for all these cases, the question of why in some non-iconic cases the causal relation is inferable (i.e. in juxtaposed sentences) while in some other it is not (i.e. *and*-conjoined sentences) would remain.

Therefore, contrary to the theoretical implications of the traditional pragmatic theories, cognitive considerations together with basic pragmatic principles suggest that the inference of temporal relations is not at all a precondition for the inference of causal ones. So, what is it that allows speakers to infer the stronger relation from the beginning? The procedure put forward within the Relevance Nomological framework offers a clear answer to this question.

Participants to a conversation will first check for the presence of causality (or other law-like grounding relations) just because these are the only laws of informational importance they have in their backgrounds. We should underline that temporal relations, for the great majority are relatively trivial law-like generalizations. They include temporal regularities like sequences of necessary conditions and private patterns of behavior (cf. footnote 11). There is nothing else in the speakers' backgrounds to be checked for in order to deliver temporal interpretations.

Now, where do the temporal interpretations come from? The solution offered by the Relevance Nomological Model implies that temporal interpretations come out as a result of failing to find of a causal law that would correctly describe the situation under consideration. Such a claim might *prima facie* be mind-boggling. Why would hearers have to check for causality first before inferring simple temporality? As was pointed out, this is just because causality is more informative since it encloses temporality, and if the hearer presupposes the existence of causality, temporality comes out automatically. However, if the hearer takes a bet for temporality alone, he might miss causality. Therefore, the most efficient strategy to gain as much information as possible is to presuppose causality.

Last but not least, the proposal put forward here is confirmed by experimental studies. The reading times of symmetrical, temporal and causal *and* clearly show that causal interpretations of *and* are the fastest, followed by temporal ones (see Thompson et al. 2011 for English). If an interpretation involving a double-step procedure were effective, the causal interpretation would take more time, since it would be more complex than a temporal one. Moreover, causality also seems to be a facilitator for the interpretation of juxtaposed sentences independently of the order of presentation of the events. When clear causal relations are present (pushing-falling kind of relation, for instance), juxtaposed sentences are read equally fast in both iconic and non-iconic orders (cf. Moeschler et al. 2006; Blochowiak et al. 2010 for French). Even more interestingly, if a causal relation is less obvious (i.e. not so frequently used), the sentences are read faster in non-iconic order, which puts additional doubts on the "temporality first" type of approaches.

Summing up, the "causality first" proposal seems to be deeply rooted both in the cognitive priorities of linguistic agents and in their interpretative strategies, encoded in general pragmatic inferential mechanisms.

4 Conclusion

This paper offered a solution to a couple of puzzles within the Relevance Nomological Model. In particular, the famous puzzle of causal interpretations of *and*, which seemed to be restricted by the order of events (iconic vs. non-iconic) as well as Horn's counterexample received a

[12] I thank an anonymous reviewer for this suggestion.

unified explanation via the presuppositional mechanisms of conjunction.

With this mechanism the causal interpretation of the puzzling examples comes out as a pragmatic presupposition triggered by the events (described either by conjuncts in *and*-sentences or by the juxtaposed sentences) together with the presupposition that a relevant causal law is applicable to the situation at hand. The impossibility of inferring causal relations with *and* when the conjuncts are in non-iconic order is due to a specific property of the conjunction, which is not restricted to its causal uses, namely, the fact that *and*-sentences do not project the presuppositions of their conjuncts symmetrically (cf. (20)). In particular, the conjunction together with a non-accidental generalization expressing a law behaves like a presupposition filter, and this is why the causal interpretation is blocked with non-iconic order.

The possibility of cancelling causal relations both in juxtaposed and *and*-sentences is also quite easily explainable by the mechanisms of presupposition failure, i.e., cancelling in situations where the participants of a conversation may just wrongly assume a given law to be applicable to the situation under discussion.

Furthermore, the solution implied by the Relevance Nomological Model suggests that in the case of *and*, causal interpretation will almost always be tried out first by the participants of a conversation. The temporal interpretation will appear as the result of failing to find a causal one. Such a "causality first" proposal is in opposition with most of the theoretical solutions offered so far (in implicature or default approaches), but it has the crucial advantage of agreeing with the experimental results which univocally demonstrate that causal relations are the fastest to process, strongly implying their interpretational priority over temporal relations.

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