

Where do pragmatic meanings come from? The source of temporal inferences in discourse coherence*

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1 The question

A major part of the work of Leo G.M. Noordman has been dedicated to elucidating the role of inference processes in the production and comprehension of discourse coherence. He has made crucial contributions to the formulation as well as to the solution of this problem, from Noordman (1979) to Sanders, Spooren and Noordman (1993), among many others. I had the great honor of working with him when he supervised and promoted my doctoral dissertation (Bohnemeyer 1998b), along with Eve Danziger and Steve Levinson. This study dealt with the role of temporal inferences from aspectual information in German and Mayan discourse. During my defense in November 1998, Steve Levinson asked a question – essentially the question that figures in the title of this paper – that I did not completely answer then. It was not until later that the true importance of this question and the range of implications of the possible answers began to dawn upon me. I would like to take this opportunity of honoring the research of Leo Noordman by trying to give a new answer to Levinson's question.

Bohnemeyer (1998a, b) studies the maintenance of temporal coherence in Yukatek Maya, an indigenous Mesoamerican language spoken on the Yucatan peninsula. What makes Yukatek an interesting case for an investigation of the mechanisms of temporal coherence is that expressions of event order are almost entirely absent from the grammatical and lexical code of this language. That is, there are no absolute or relative tenses, and no temporal connectives translating *after*, *before*, or *while*. Nevertheless, a referential-communication study with a video stimulus (the Temporality Elicitation Stimulus TEMPEST) showed that speakers of Yukatek and speakers of German are equally capable of identifying, categorizing, and communicating the orders of the events in the video clips. Both groups performed equally well on the task, despite the fact that the German speakers coded (i.e. overtly expressed) the order of the events in 92 percent of their reference acts, whereas the Yukatek subjects did so in just 1 percent of their utterances.

These findings are interpreted in Bohnemeyer (1998b) in terms of the controversy between universalist and relativist views of the relationship between semantic and cognitive representations. The universalist hypothesis predicts that event order must be coded in every language, because it forms an indispensable part of human mental representations of the world. This is explicitly argued e.g. in Alverson (1994). The relativist hypothesis, on an orthodox interpretation e.g. of Whorf

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(1956), holds that the cognitive representations in the speakers of a language are determined by the linguistic representations afforded by the language, which is to say, by the structures of the language. Neither hypothesis is supported by the outcomes of the TEMPEST study. The universalist expectation that event order should be coded in Yukatek is frustrated, if not by the language itself, by the fact that even those exceptional resources the language does offer to represent event order were only marginally used by the Yukatek subjects during the TEMPEST sessions. The orthodox relativist position predicts that Yukatek speakers should be significantly disadvantaged vis-à-vis German speakers when it comes to distinguishing the event order in the TEMPEST videos: since their language does not distinguish event order, the speakers should also fail to cognitively distinguish event order. This expectation is frustrated by the fact that the error rates during the TEMPEST sessions were almost identical across German and Yukatek subjects.

Neither the universalist nor the relativist hypothesis is in line with the TEMPEST data, because both presuppose a strong isomorphism between cognitive and semantic representations. Both hypotheses assume that in order to verbally communicate the contents of a mental representation, these contents have to be coded. But this is an essentially pre-Gricean view of linguistic meaning! Grice (1975, 1981, 1989) has shown that an important part of linguistic meaning is not coded, but derived from the semantically impoverished code of the message through pragmatic enrichment in context. It was shown in Bohmeyer (1998b) that along these lines, defeasible temporal inferences from aspectual and modal information can be analyzed as Gricean *Generalized Conversational Implicatures* (GCIs). Such inferences occur in discourses in Indo-European languages as well as in Yukatek discourse. Thus, the use of the simple past tenses in (1a) below entails boundedness (or completedness) of the two events of sautéing some mushrooms and calling Colette. The default interpretation of a combination of two events that are both presented as bounded is that these events are ordered sequentially. Accordingly, in the absence of further information, (1a) implicates (1b). (But this is a rather weak implicature, as we have little reason to assume that it is impossible for Roberto to call Colette *while* he was preparing food, and there is nothing in the truth conditions of (1a) that would be violated by this interpretation.)

- (1) a Roberto sautéed some mushrooms and called Colette.
 b He called Colette *after* he sautéed the mushrooms.
 (2) a Mandana was working in her garden. Frank arrived.
 b Frank came *while* Mandana was working in her garden.

Similarly, the use of the past progressive in the first clause in (2a) represents the event of working in the garden as unbounded (or incomplete). The combination of an event presented as unbounded and one that is presented as bounded is by default interpreted to the effect that the two events overlap. Specifically, the time of the event referred to as bounded is inferred to be included in the time of the event referred to as unbounded. Hence, (2a) implicates (2b) (even though (2a) does not actually entail that Mandana continued working after Frank's appearance, but merely, that Mandana had *not* completed her garden work *before* the time of Frank's arrival - so this too is clearly a *defeasible* inference).

Inferences from aspectual or modal information to event order are not particular to Yukatek discourse; they are just exploited to a greater extent than in Indo-European languages. Based on these GCIs, it is possible for both speakers and hearers in Yukatek to reliably communicate event order, without (with marginal exceptions) ever coding it.

Bohnmeyer (1998b) rests on the assumption that languages differ in the meanings they systematically code. That is, languages differ in which meanings they provide morphemes or constructions for. Or, in Grice's terms, they differ in *what can be said* in them. At the same time, Bohnmeyer (1998b) holds that meanings that can be coded in language L1 may only be implicated in language L2 (or, more precisely, what can either be coded or be implicated in L1 may mostly only be implicated in L2. Specifically, event order may be conveyed by coding or by implicature in Indo-European languages such as German, but may, with certain exceptions, only be conveyed as GCIs in Yukatek). In other words, Bohnmeyer (1998b) assumes that *what can be said* in L1 may equate *what can be implicated* in L2. *But where*, Steve Levinson asked, *do these implicated meanings then come from, in a language in which they cannot be coded?*

To understand this question, it is best to look at the options Levinson himself suggested while formulating it: the content of GCIs may either depend on the language-particular form of the utterance, and thus ultimately derive from the code of the language, or else they are universal, language-independent meanings. Many types of GCIs hinge upon the relationship between *what is said* in a given utterance and *what could have been said* instead, by choosing a different form to convey (largely) the same truth-conditional content. Take, for example, the implicatures generated by Grice's Quantity Maxims. Following Grice's Second Maxim of Quantity, "Do not make your contribution more informative than is required," (3a) is interpreted to implicate (3b), even though it by no means excludes (3c), simply because the addressee will assume that the speaker would have *asserted* the more informative (3c) if (s)he had *meant* it.

- (3) a James has seen some of Lynch's films.
b James has not seen all of Lynch's films.
c James has seen all of Lynch's films.

Similarly, some of Grice's Manner Maxims, such as "Avoid obscurity of expression" and "Avoid prolixity", account for the inference of (4b) from (4a): (4c) is *logically* consistent with (4a), but if the speaker had *meant* (4c), why should (s)he not have chosen to utter (4c), since that would have been the most simple and straightforward way of conveying the intended message?

- (4) a James didn't dislike Lynch's latest film.
b James didn't exactly like Lynch's latest film.
c James liked Lynch's latest film.

Such implicatures have a metalinguistic source: they derive from the contrast between expressions of different structure that share a relevant set of truth conditions. They are, therefore, entirely language-particular. For example, the default construction used to express a caused breaking event in English is (5c). Therefore, it is associated with the stereotypical semantic construal of such an

event, and whenever the more complex construction (5a) is used, an implicature to (5b) is invited. But suppose *break* did not participate in the English causative alternation, and the simple transitive construction (5c) would not be available: then there would be no reason to derive (5b) from (5a), since (5a) would be (one of) the canonical way(s) of causativizing *break*.

- (5) a Anna caused the vase to break.
 b Anna did not break the vase through direct
 c Anna did not break the vase through direct physical impact.
 d Anna broke the vase.

This cannot be the right account of temporal implicatures in Yukatek, because that would imply that the use of boundary operators in discourse implicated event order through some contrast with expressions of event order, and Yukatek Maya *lacks* such expressions. (And to the extent that the implicatures from aspectual information to event order are comparable across Yukatek and English, metalinguistic contrasts cannot be the source of these implicatures in either language.) This, however, cannot be taken to mean that inferences from aspectual information to event order could operate entirely *independently* of the linguistic code. By definition, GCIs arise as default interpretations of utterance types.¹ They differ from the other type of conversational implicatures discussed by Grice, the Particularized Conversational Implicatures (PCIs), precisely in that they do not depend on assumptions about speakers's and addressees's communicative intentions during particular conversations. If speaker X says *It's awfully late!*, I may take this e.g. as an apology, an invitation, a warning, or an expression of worry, depending on what I know or assume about X's concerns at the moment of utterance. But the default interpretations carried by (1) and (2) do not depend on what one believes the speaker's state of mind to be when uttering (1) or (2). Indeed, event-order inferences from aspectual information are GCIs precisely because they arise from the coding of aspectual information. The claim is that the marking of aspectual distinctions in discourse triggers default interpretations in terms of event order. What needs to be explained, then, is just *how* it is that aspectual information relates to event order. This question is answered in Section 2 of this article.

As an alternative solution, Levinson suggested that some meanings might have to be assumed to be universal, and available to speakers and addressees of all languages even if 'disembodied', as it were, i.e. even if they are not coded in their language. Presumably, such meanings would directly spring from cognitive representations, which are then simply expressed pragmatically instead of semantically. There are various conceivable lines of response here, without it being immediately obvious which one to chose. First of all, it may be noticed that this position cannot be totally wrong. The outcomes of the TEMPEST study indeed suggest that however different

¹ Cf. Levinson (1995, in press). Levinson (in press: Section 1.1) restates Grice's (1975, p. 56-57) definition as follows: "An implicature *i* from utterance *U* is *particularized* iff *U* implicates *i* only by virtue of specific contextual assumptions which would not invariably or even normally obtain; An implicature *i* is *generalized* iff *U* implicates *i* unless there are unusual specific contextual assumptions that defeat it."

mental representations of event order across native speakers of Yukatek and German may be, they do share certain properties that allow both groups of consultants to distinguish two videos whose content is minimally distinct precisely in the order of events, and to determine which of the two videos one consultant had seen precisely by this minimal difference in event order. And since the TEMPEST subjects had to solve a referential communication task, and they both did solve the task in about 85 percent of the cases,² they both must have been able to communicate, among whatever other properties their linguistic (semantic or pragmatic) representations had, precisely those features that allowed them to identify the videos by the order of the events they show.

Some parts of the mental representations of event order were shared among the German and the Yukatek subjects, and they managed to communicate these shared features of their mental representations by either coding them (as the German subjects did in 92 percent of their reference acts) or by implicating them (as the Yukatek consultants did in 99 percent of their reference acts). However, this does *not* mean that the shared mental representations were implicated by the Yukatek speakers just *by virtue* of not being coded. It does not mean, in other words, that cross-culturally shared cognitive representations are *automatically* available in semanto-pragmatic representations, either as coded meanings, or, if not, as a simple *residue* of what is coded, as implicated meanings. If this were true, linguistic (i.e. semanto-pragmatic) and cognitive representations would have to be assumed to be largely isomorphic, despite the evidence presented e.g. in Levinson (1997, p. 13-25) and Putnam (1988, p. 8-15) to the effect that this cannot in fact be the case, and the universalist hypothesis that event order is expressed in all languages because it is mentally represented in all human beings would not be disproved by the TEMPEST study, but would on the contrary be largely confirmed by it, with the minor revision that there is a typological parameter that determines which (parts) of the universal event order meanings is coded in a language, and which part is communicated by implicature, an apparently largely arbitrary decision. However, it cannot in fact be the case that event order is automatically implicated if it is not coded, because the content of the implicatures from aspectual information to event order is never exactly the same as the content of coded event order representations. The question just what *is* in fact the content of the implicatures is addressed in Section 3.

Section 4 returns to the theory to Gricean conversational implicatures. Given that temporal implicatures from aspectual information are GCIs, but are not rooted in metalinguistic contrasts, then to what type of GCIs do they pertain? Section 5 summarizes what is universal and what is language-particular about temporal implicatures.

2 The Principle of Partial Complementarity between boundary information and event order

In order to understand how event order is inferred from aspectual information, it is necessary to start from an analysis of the semantics of aspectual operators. In Bohemeyer (1998b, p. 71-94), six

² See Bohemeyer (1998a, 1998b: ch. 10) for the experimental protocol and the exact figures.

'notional' aspectual operators are proposed.³ Each of these selects a different part of the event to which it is applied for assertion. Perfective operators present the event as bounded, that is, they include the initial and terminal boundary of the event in the scope of assertion. Imperfective operators, in contrast, exclude the boundaries of the event from assertion, and hence present the event as unbounded. The past progressive tense in (6a) includes an imperfective operator; accordingly, (6a) is no contradiction, since termination of the event is not entailed in the first clause. In contrast, (6b) is a contradiction, to the extent that the simple past tense in the first clause embodies a perfective aspect and hence entails boundedness of the event.⁴

- (6) a (When I saw her) yesterday, Mary was writing a letter, but she didn't finish it.
 b ? Yesterday, Mary wrote a letter, but she didn't finish it.

Ingressive and egressive operators select the initial and terminal boundary of the event, respectively, for assertion. In English, these are lexicalized in 'phase verbs' (or 'aspectual verbs') such as *begin*, *start*, *stop*, *finish*, *end*. Finally, pre-state operators, such as the 'prospective' *be going to* construction of English, and post-state operators, such as the English perfect tenses, select pre- and post-states of the event for assertion. These are conceived of not merely as time-intervals preceding or following the event, but as stative events in their own right, which are related to the event in a causal chain (cf. Smith 1991, p. 33-36). For example, (7) cannot be truthfully asserted of any time preceding Mary's writing the letter (and note that (7) does not even entail that the letter was actually ever written), but

³ They are notional in the sense that together, they form a theoretical (i.e. language-independent) account of aspectual semantics. A language-particular aspectual operator may neutralize the opposition between two or more of these aspectual meanings, combine one or more of the aspectual meanings with non-aspectual meanings (such as tenses), and show selectional restrictions with respect to particular classes of verb lexemes. Moreover, the aspectual value of an event expression may not be overtly marked at all, but may itself arise only from implicature (this is the default in a largely aspectless language such as German). In the present framework, it is assumed that every event expression (i.e. every clause, every predication, and every verb form) can be assigned a notional aspectual operator, regardless of whether or not this operator is overtly marked.

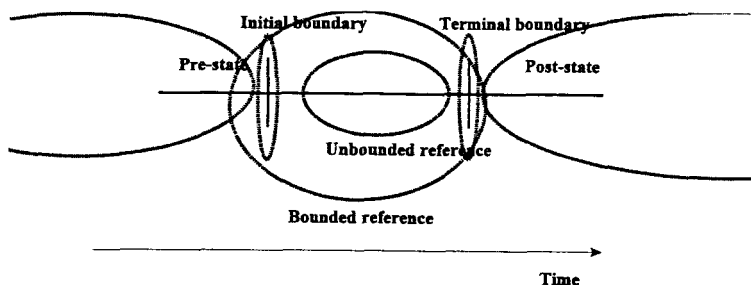
⁴ Native speakers disagree on the acceptability of (6b). This to me suggests that the common supposition of perfectivity being coded by the simple past when applied to non-stative verbs (held e.g. by Brinton (1988, p. 16), Klein (1994, p. 9, 102-107), Matthews (1994, p. 82-85), and Smith (1991, p. 220-222)), may not be fully warranted – the simple past may in fact convey merely an implicature of perfectivity that arises from the opposition with the marked past progressive. Of course, to the extent that the boundedness of event coded using the simple past is itself defeated, the default inferences invited by perfective aspects will not be invited in the first place. – Note that the contrast *X was VERB-ing, but did not / VERB / finish VERB-ing*, the so-called imperfective paradox (cf. e.g. Dowty, 1979, p. 145-150), arises only with telic verbs, i.e. verbs which designate events that can only be said to have occurred once a certain definite end-state has been achieved. – Similar accounts of aspectual semantics as the one proposed here, i.e. accounts that draw on the selection of different parts of an event for assertion by the aspectual operators, have been proposed in particular by Bartsch (1986), Breu (1985, 1994), Chung and Timberlake (1985), Dowty (1979), Klein (1994), and Smith (1991). For a comparison to different approaches, in particular the widespread equation of aspectual with *aktionsart* meanings (arguing e.g. that a progressive marker renders a dynamic event stative), see Bohmeyer (1998b, p. 85-86).

only to a time at which Mary e.g. *intended* to write the letter, which qualified as a causal pre-condition of the letter being written.

(7) Mary was going to write a letter to the editor of the New Yorker

The six notional aspectual operators select different parts of the event for assertion. These event parts are crucially defined with respect to the boundaries of the event. Therefore, the notional aspect operators are termed boundary operators in Bohnemeyer (1998a, b). The various parts of the event selected by the boundary operators are schematically represented in Figure 1.

Figure 1. Selection of event parts by the six logical boundary operators (example)



The 'selectional' approach to aspectual semantics is fully compatible with the widely known viewpoint approach to aspect, as promoted e.g. in Comrie (1976), Holt (1943), and Smith (1991). Each of the six notional boundary operators defines a different viewpoint on the event: imperfective aspects open up an internal perspective (excluding the event's boundaries), perfective aspects provide an external (global) perspective (one that includes the boundaries), ingressive view the event as commencing (from the initial boundary), and so on. The viewpoint metaphor is introduced here, because it is rather helpful in informally explaining the coherence-inducing force of boundary operators. In multipositional discourses, the viewpoint of an aspectual operator is by default identified with the time of an event referred to by an adjacent clause. Let us call the event the boundary operator is applied to the target event. If the target event is presented as bounded, an inference arises that it is viewed externally, i.e. from a second event that does not overlap with it. This inference goes through if the second event is presented as bounded as well. Since the two events are interpreted not to overlap, they are understood to follow each other in sequence: (henceforth, the symbol $+>$ is used to indicate conversational implicature, following Levinson (1995, in press)).

- (8) John entered Mary's office. He lit a cigarette.
 +> J.'s entering M.'s office and his lighting a cigarette did not overlap.
 +> J. lit the cigarette consecutively to his entering of M.'s office.

The precise order of the two events is then derived from an independent implicature to the effect that the order of mention iconically mirrors the order of the events. Conversely, if the target event is presented as unbounded, it is "viewed from the inside", and an implicature is invited to the effect that this internal perspective aligns with an event that overlaps with the target event. If the second event is itself referred to as bounded, it will be understood to be temporally included in the target event (if not, it will be inferred that the two events are ordered simultaneously). In (9), the bounded event expressed by the first clause is understood to fall into the time of the event expressed by the progressive clause.

- (9) John entered Mary's office. Mary was dozing at her desk.
 +> J. entered overlapping with M.'s sleeping.

The inferences from unboundedness of the target event to overlap with another event and from boundedness of the target event to non-overlap with another event are the most pervasive temporal inferences in discourse. Inferences from unboundedness to overlap may also be considered responsible for the behavior of pre- and post-state operators, to the extent that these can be analyzed as expressing true states. (10) gives an example of a pre-state operator, the *be about* to construction.

- (10) *John entered Mary's office. Mary was about to make a phone call.*
 +> {J. entered the office overlapping with the pre-state of M.'s making a phone-call
 → J. entered the office before M. made the phone call.}

Note that the second inference in (10), the one from overlap with the pre-state of Mary's phone call to precedence with respect to that event, is indefeasible. But of course this second inference depends on the first one and will not arise if the first inference is defeated or cancelled. In this way, to each of the six notional boundary operators, a temporal implicature can be related that spells out the default event order associated with the viewpoint that the boundary operator introduces. The six temporal implicatures that result are termed Boundary-To-Order (BTO) Inferences in Bohnemeyer (1998b).⁵

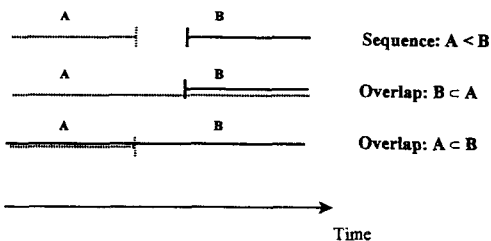
Now, BTO implicatures can be shown to reside in a partial complementarity of boundedness and event order. This complementarity may be illustrated by the examples in (11).

⁵ Since every clause contains a logical boundary operator, and event order relations are inter-clausal relations, a projection problem arises, in case a clause implicating overlap is combined with a clause implicating sequence. In this case, a strikingly simple projection rule resolves the conflict: any implicature to overlap *overrides* any implicature to sequence. Evidently, this rule derives directly from the partial logical complementarity of boundary patterns and event order to be outlined below: only events that are separated in time by at least one boundary each can be ordered sequentially.

- (11) a Roberto was in Lyon after Birgit had a cold.
 b James has been very busy since Anna has been in the field.
 c Before Eva was a semanticist, she was a syntactician.

In all these utterances, a temporal connective is used to combine two *stative* clauses (which may render the discourses somewhat marked stylistically). In order to interpret the connectives, one infers boundaries to the stative events, which are not entailed by the combinations of stative verb phrases and the simple past (the simple past entails neither boundedness nor unboundedness with statives, but the default interpretation is unboundedness). It is indefeasibly inferred that Birgit's cold had passed by the time Roberto was in Lyon, and that there was a time where Anna was not in the field.⁶ An event A can only precede an event B if A has a terminal boundary and B has an initial boundary. Consider the diagram in Figure 2: if the terminal boundary of A or the initial boundary of B is lifted, the two events necessarily overlap.

Figure 2. *Event boundaries and event order*



Conversely, no interval during which A and B overlap can contain a boundary (initial or terminal) of either A or B. Therefore, every assertion about the order of two events entails information about the boundaries of these events. The opposite does, of course, not hold, because boundary operators are applied to single event expressions. However, boundary information is asserted *in view* of event order. As such, *all* events are bounded, except for truly atemporal events. Therefore, if an event is *presented* as bounded, unbounded, beginning, etc., it is *presented* as bounded, etc. *from a certain viewpoint*. This viewpoint can be the moment of utterance, a calendrical time index, or the time of another event in the universe of discourse (which may or may not have been mentioned in the context). (12) illustrates an event asserted as unbounded with respect to the moment of utterance (a), a

⁶ Note that it is not entailed in (11a) that Roberto was *not* in Lyon *before* Birgit's cold was over or that James was *not* very busy *before* Anna left for the field; cf. Heinämäki (1974, p. 104-115). Only in (11c), both states are interpreted to have boundaries, because we tend to assume that these particular states exclude each other (although we know this is not necessarily the case).

calendrically defined time (b), and the time at which another event is located (c). In all three cases, the viewpoint is determined by an overt question.⁷

- (12) a What is Birgit doing? - She is **writing** a grammatical sketch of Goemai.
b What was Birgit doing **yesterday at 3 p.m.**? - She **was writing** a grammatical sketch of Goemai.
c What was Birgit doing **when Sergio returned from the field**? - She **was writing** a grammatical sketch of Goemai.

One of these options *must* be realized whenever a boundary operator is used. It is then the role of enrichment from context and world knowledge to determine *which* of these options is instantiated. Also, in case the viewpoint is assumed to coincide with another event in the discourse representation, it must be inferred *which* of the events in a multipositional discourse defines the viewpoint. Furthermore, even in case the viewpoint is inferred to coincide with another event referred to in discourse, the event order implicature may still be blocked or cancelled in a particular context. This shows that to serve in communicating event order is not the sole function of boundary operators. Consider again the case of (2), *Mandana was working in her garden. Frank arrived*. The event of Frank's arrival clearly provides the viewpoint with respect to which Mandana's garden work is presented as unbounded. However, out of context, information is insufficient to decide whether this particular Mandana will have continued her work past this particular Frank's arrival, or whether she will have stopped working upon seeing him. Not knowing anything about the two people and the purpose of Frank's visit, not having any reason to assume that Mandana would not have continued her activity, overlap may go through as the default inference. But suppose it is known that Mandana and Frank had an appointment to have coffee together, and that Mandana was merely doing garden work while waiting for Frank. In that case, the progressive in (2) is not used to implicate overlap, but merely to indicate that Mandana's gardening had not terminated *before* Frank's arrival. Due to specific contextual knowledge, the gardening event is then inferred to be bounded *by* Frank's arrival, and this inference overrides or blocks the default interpretation of overlap. But, as the TEMPEST study has shown, as long as speaker and addressee can rely on sharing the relevant background assumptions, the default interpretations are perfectly sufficient to communicate event order.

It is now possible to give a tentative answer to the question as to where the event order information conveyed by BTO implicatures comes from. Event order and event boundaries are partially complementary. This complementarity allows languages (like German) to focus on event order and leave boundary information underspecified, or to focus on event boundaries, leaving order underspecified (as in Yukatek). The principle of partial complementarity of boundedness and

⁷ The temporal viewpoint of a proposition is the time for which the proposition is asserted to be true, or for which it is asked whether the proposition holds, etc. Klein and von Steutterheim (1989, 1992) have argued that this time is one out of various *topical* elements of the proposition that can *always* be construed as answering a question (the 'quaestio'), which usually remains implicit. Therefore, Klein (1994) calls the time for which a proposition is asserted the *topic time*. An alternative approach has been proposed by Hinrichs (1981, 1986), in which the temporal viewpoint is identified with Reichenbach's (1947) 'reference point'

order must be part of that part of the time concept that is shared among speakers of German and Yukatek, because it governs the use of both event order operators and boundary operators alike. This does, however, *not* mean that coded and implicated representations of event order are identical in content. They are, in fact, not, as is shown in the following section. Which means that BTO implicatures do not merely flow from universal cognitive representations of event order, whenever these are not coded. Nor, for that matter, does the fact that speakers of Yukatek and German share a core concept of events with their boundaries and topological relations of sequence and overlap mean that the time concept is globally identical across the two cultures.⁸

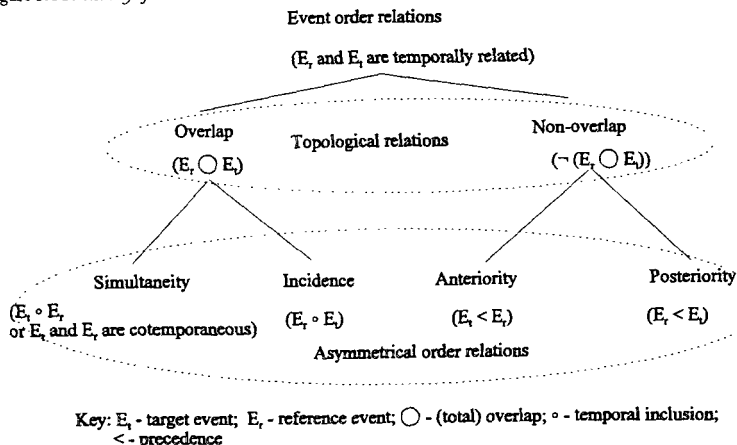
3 The content of Boundary-to-Order Implicatures

BTO implicatures are governed by a part of the time concept that is presumably shared across speakers of Yukatek and German. But this only explains the fact that the BTO inferences are *derived*, and the logic by which they are derived. It does *not* account for the precise content of implicated representation of event order. This content is not automatically *copied*, as it were, from some putative universal mental representations of event order, as soon as these fail to be coded in a language. This can be seen from the fact that the content of coded and implicated representations of event order is not in fact identical. To understand this, let us examine more closely the nature of event order relations.

In Bohnermeyer (1998b, p. 87-97), an exhaustive set of 13 logical event order relations, based on Allen (1983), is taken as starting point. It is shown that these can be composed out of four primitive event order relations plus additional distinctions of distance and overlap of boundaries. To date, only the four basic relations have been attested to be actually lexicalized in the languages of the world. The composite relations are represented with the help of boundary and distance operators. As this is so, only the four basic event order relations of anteriority, posteriority, simultaneity and incidence need to be considered in what follows. It can be shown that these four basic event order relations derive from two even more fundamental topological relations: overlap and non-overlap (or sequence). Non-overlap spells out anteriority or posteriority, depending on the choice of reference and target event, and overlap subdivides into simultaneity and incidence, depending again on the choice of reference and target event. The taxonomy of topological relations and asymmetric event order relations is represented in Figure 3.

⁸ Imagine a fictive culture with a truly *arctular* time concept, i.e. one in which $A < B$ entails $B < A$ and vice versa, or one with a *multi-dimensional* time concept, i.e. one which recognizes pairs of events which neither overlap nor follow each other. In both cultures, the BTO implicatures would still be essentially operative. But of course, the ultimate *product* of the inference, i.e. the inferred event order, would depend on the time concept. For example, under a multi-dimensional time logic, non-overlap does not necessarily spell sequence, so there would be room for additional inferences.

Figure 3. *A taxonomy of event order relations*



Only the asymmetric event order relations are ever coded by temporal connectives or true 'relative tenses'.⁹ In contrast, it is precisely the topological relations of overlap and non-overlap that are implicated by BTOs. (13) and (14) illustrate this by temporal clause constructions representing the event order of (1) and (2) (which are repeated as (13a) and (14a)).

- (13) a Roberto sautéed some mushrooms and called Colette.
 b Roberto called Colette **after** he sautéed some mushrooms.
 c Roberto sautéed some mushrooms **before** he called Colette.

- (14) a Mandana was working in her garden. Frank arrived.
 b Frank came **while** Mandana was working in her garden.
 c Mandana was working in her garden **when / at the moment that /** Frank arrived.

Temporal connectives (conjunctions, adverbials, etc.) express relations between two clauses or sentences, but must at the same time be part of one of them. Therefore, they necessarily involve a reference-event-target-event asymmetry. BTO implicatures, in contrast, convey exclusively topological relations of overlap and non-overlap (i.e. sequence). In case an implicature to sequential ordering is conveyed, an independent iconicity inference takes care of the particular order of events. This can be seen from the reversal of event order conveyed by (15) with respect to (1)/(13a).

- (15) Roberto called Colette and sautéed some mushrooms.

⁹ Most of what has been traditionally treated as relative tense is considered aspectual in Bohmeyer (1998b, p. 98-115), following Klein (1994).

While it appears to be true that the derivation of BTO implicatures is governed by the same properties of the time concept that also form part of the cognitive representations which control the use of event order operators, it is not the case that the same meanings correspond to these mental representations, regardless of whether these meanings are coded or implicated. It is therefore not the case that these event order representations are available language-independently, as disembodied meanings. Just *how, by what communicative mechanisms*, is it that topological relations are inferred to obtain from the presentation of an event as being bounded, unbounded, beginning, etc.?² This question is tackled in the next section.

4 Boundary-to-Order Implicatures and the theory of Generalised Conversational Implicatures

In Section 2, it was argued that the event order relations conveyed by BTOs stem from a core part of the time concept itself, via the principle of partial complementarity of boundary information and event order. In Section 3, it was shown that this content is nevertheless not identical to the content of *coded* representations of the same event order relations. The question therefore arises of what is the precise nature of the communicative mechanisms that create the BTOs from the cognitive representations in which their content is rooted.

The first step towards answering this question is to realize that there are *two* such mechanisms, two different inference routines, involved in the derivation of BTO implicatures. Recollect the discussion of (2) at the end of Section 2: The use of the progressive in *Mandana working in her garden* represents the gardening event as unbounded. This gives rise to a default interpretation to the effect that the viewpoint with respect to which the gardening event is asserted to be unbounded is determined by another event which overlaps with the gardening event. A second inference identifies this other event as Frank's arrival. In (2), Frank's arrival is of course the only available candidate for the role of the event that provides the viewpoint, but in larger discourses, the choice will not always be that obvious. And the possibilities increase in a tenseless language such as Yukatek in which the form of the progressive clause does not determine whether the viewpoint is at the moment of utterance or at a time prior to it, so every utterance has to be checked for the possibility of being asserted in view of the utterance situation, rather than in view of another event referred to in adjacent discourse. Crucially, the output of the second inference may lead to a revision of the first inference. For example, if Frank's arrival is identified as the viewpoint with respect to which Mandana's gardening is asserted to be unbounded, and if it is e.g. known that Frank had come to visit Mandana, this may give rise to a cancellation of the inference that the two events overlap.

Having isolated these two inference routines involved in the derivation of BTOs, let us try to identify them in a systematic approach to conversational implicatures. Among the original Gricean maxims of Quality, Quantity, Relation, and Manner, all flowing from a general Cooperative Principle, only the first maxim of Quantity ("Make your contribution as informative as is required"), the second maxim of Quantity ("Do not make your contribution more informative than is required"), and the first and third Manner maxims ("Avoid obscurity of expression" and "Be brief

(avoid unnecessary prolixity)", respectively (Grice 1989, p. 26-27)) are considered to create Generalised Conversational Implicatures (GCIs) in Levinson (in press). The Quality maxims and the second and fourth Manner maxims are discarded from triggering conversational implicatures altogether, and the Relation maxim ("Be relevant") is thought of as being responsible for Particularised Implicatures only. Those maxims that do generate GCIs are bundled up in Levinson's account, forming three communicative heuristics of information enrichment: the Q-heuristic ("What isn't said, isn't"), the I-heuristic ("What is simply described is stereotypically exemplified"), and the M-heuristic ("What's said in an abnormal way, isn't normal", or: "Marked message indicates marked situation"). The Q-heuristic corresponds to Grice's first Quantity maxim, the I-heuristic to his second Quantity maxim, and the M-heuristic to the first and third Manner maxims. The interaction of the three heuristics in information enrichment may be conceived of in the following way: the I-heuristic assigns stereotypical interpretations to simple unmarked expressions, whereas the other two principles operate on the contrast between such simple expressions and more marked alternatives. The M-heuristic triggers an inference to a marked interpretation in case a marked expression is chosen, and the Q-heuristic yields an inference to negation of the entailments particular to the marked alternative in case this alternative is not chosen. An example of a Q-implicature is (3) in the introduction; examples of M-implicatures are (4) and (5).

BTO inferences cannot be M-implicatures, because they operate on marked and unmarked expressions alike. In fact, all the examples discussed above, (1), (2), and (8)-(10), feature unmarked expressions. Neither can BTO inferences be Q-implicatures, because the content they convey does not seem to depend on the existence of more marked alternatives. More generally speaking, — and Q-implicatures are *metalinguistic* implicatures that receive their meanings from contrasting expressions in the language. They are therefore excluded as possible sources of BTO inferences, because such contrastive expressions do not occur in Yukatek.¹⁰

By exclusion, the I-heuristic remains as the only possible source of BTO inferences. The I-heuristic is also considered to account for another very important type of temporal inference, namely the iconicity inference from order of mention to event order, illustrated in (15) above (cf. Levinson in press §2.3). Indeed, it seems to be the case that BTO implicatures generate stereotypical interpretations as well. Consider one last time example (2). If Mandana's gardening is presented as unbounded, and Frank's arrival is inferred to be the vantage point from which it is viewed as unbounded, this does not necessarily mean that the two events overlap. The inference may be blocked or cancelled due to contextual information that, in very broad outline, suggests some kind of causal link between the two events (for example, Frank's arrival causing Mandana to quit her garden work).¹¹ But in the absence of such information, there is no reason to assume any boundary to Mandana's garden work before, at, or past the time of Frank's arrival, and in this case the

¹⁰ One criterion that fairly reliably identifies metalinguistic implicatures is the possibility of *metalinguistic negation* (Horn 1984, Levinson in press §3.5.5). This qualifies (3)-(5) as metalinguistic, but rules out (1) and (2), cf. *James hasn't seen some of Lynch's films, he's seen every single one of them!*, *Anna didn't cause the vase to break, she simply broke the bloody thing!*, but not **Roberto didn't sautéed some mushrooms and call Colette, he sautéed the mushrooms before he called Colette.*

¹¹ It generally appears to be the case that causal inference override BTOs; cf. Lascardes & Asher (1992, 1993).

complementarity of boundary information and event order calls for the interpretation of overlap.

But what about the second component of BTO implicatures isolated above, the one that takes care of the identification of the viewpoint? This inference does not by itself create any interpretations that could be generalized, and it does not seem to be governed by general rules. Therefore, it appears to be possible to account for this type of inference by Grice's Relation maxim, or by a general-purpose information-optimizing strategy such as proposed in Sperber & Wilson (1986).

5 Conclusion: Universal and language-particular aspects of temporal implicatures

It has been argued in this paper that temporal implicatures from aspectual information generate stereotypical event order interpretations based on the partial complementarity of boundary information and event order. The presentation of an event as bounded, unbounded, beginning, etc., implies a certain vantage point from which it is viewed as bounded, unbounded, etc. This viewpoint is identified with the moment of utterance, a calendrically defined time, or the time of another event in discourse. Unless there is specific information to the contrary, the default interpretation goes through that the event is bounded, unbounded, beginning, etc., at the inferred time, which implies an event order relation according to the complementarity principle.

Let us briefly summarize which aspects of BTO inferences are considered universal and which are considered language-particular or culture-particular on the account presented here. The content of BTO implicatures is derived from cognitive representations of events in time, specifically according to the partial complementarity of boundary information and event order. To the extent that the BTO implicatures are concerned, it can be concluded from the TEMPEST study that the relevant part of the time concept is shared across speakers of German and Yukatek. This does not mean that the time concept is identical or similar *beyond* these properties. The derived event orders become available as pragmatic meanings in conversation, because general principles of information enrichment in context lend them the status of default interpretations (i.e. Gricean GCIs). These principles, and in this case specifically the I-heuristic (corresponding to Grice's second Quantity maxim), are assumed to be themselves universal in Levinson (in press). This assumption certainly stands to reason, but remains to be empirically validated. Finally, BTO implicatures arise from the aspectual interpretation of utterances. This aspectual interpretation of course depends on language-particular code. For example, Yukatek has a perfective aspect which marks events as bounded indefeasibly. Consequently, every use of the Yukatek perfective aspect invites the BTO implicature to non-overlap, which then may or may not be blocked or cancelled in the particular context. The English simple past is interpreted perfectly with dynamic events, at least by default. So the implicature to non-overlap only arises with dynamic verbs. The German preterite is interpreted perfectly with telic events but imperfectly with atelic events, and this is clearly a matter of defeasible default interpretation. Consequently, it depends on the telicity of the verb, but also on the context (which does or does not let the inference to perfectivity or imperfectivity go through) whether the BTO implicature to non-overlap is invited in the first place (and this implicature can then of course still be blocked or defeated in the context).

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