Concession, Implicature, and Alternative Sets*

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Abstract

We describe work in progress on how **information structure** influences the interpretation of discourse connectives. We demonstrate this influence with an analysis of the two senses of *although*, distinguished in the literature as **denial of expectation** and **concessive opposition**, refining earlier accounts that ignore information structure.

Keywords: information structure, alternative-set semantics, discourse connectives, concession, conventional implicature, pragmatic pressupposition

1 Introduction

The discourse connective *although* is a prototypical marker for **concession**, of which there are two types: (i) a conceded expectation, which we call **denial of expectation**, following [Lakoff, 1971b] and [Lagerwerf, 1998] (cf. example (1)), and (ii) a conceded adversative relation, which we call **concessive opposition**, following [Spooren, 1989] (cf. example (2)).

(1) Although Greta Garbo was considered the yardstick of beauty, she never married. [Lagerwerf, 1998]

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(2) Although he does not have a car, he has a bike. [Grote et al., 1995]

The denial of expectation in (1) involves an underlying expectation, paraphrasable as *Beautiful women usually get married.* In [Lagerwerf, 1998], this is formulated as a defeasible rule, which, in case of Greta Garbo, is violated:

(3) Normally, if a woman is beautiful then she gets married.

In concessive opposition, the main clause does not express a failed expectation, but rather a reason for drawing some conclusion with respect to a contextually pertinent open issue, so-called **tercium comparationis** (TC) [Lagerwerf, 1998], that is opposite to the conclusion one would draw on the basis of the subordinate clause. The conclusion drawn from the main clause takes precedence. In (2), a possible TC is the mobility of the person under discussion. The subordinate clause implies that he is not mobile, while the main clause implies that he is. We can formulate the following defeasible rules whose conclusions are in opposition for (2):

(4) Normally, if a person does not have a car then he is not mobile.

(5) Normally, if a person has a bike then he is mobile.

We overview existing approaches to concession in Section 2. What they have all failed to account for when interpreting either type of concession is **information structure**. Consider the pair of examples in (6) and (7), which are modeled on examples in [Dretske, 1972] and [Rooth, 1985].[1]

(6) Although Clyde married BERTHA, he did not inherit a PENNY.

(7) Although Clyde MARRIED Bertha, he did not inherit a PENNY.

These can be interpreted as either denial of expectation or concessive opposition. As denial of expectation, (6) and (7) deny different expectations, paraphrasable as (8) and (9), respectively.

(8) In normal circumstances, if it is Bertha who Clyde marries, he inherits some money.

(9) In normal circumstances, if what Clyde does with Bertha is to marry her, he inherits some money.

[1] SMALL CAPITALS indicate words carrying pitch accents, i.e., phonologically prominent elements in each sentence.

Similar observations hold for concessive opposition. Consider (6) and (7) as responses to the question *Is Clyde* HAPPY*?*: the question provides the tercium comparationis, and the main and subordinate clauses support opposite conclusions. In both (6) and (7), the conclusion to be drawn from the main clause, i.e., *he didn't inherit a penny*, is the same (i.e., Clyde isn't happy). But what leads to the opposite conclusion (i.e., Clyde is happy) differs in the subordinate clauses in (6) and (7):

(10) In normal circumstances, if it is Bertha whom Clyde marries, then he is happy.

(11) In normal circumstances, if what Clyde does with Bertha is to marry her, then he is happy.

We presented a preliminary information-structure sensitive analysis of denial of expectation in [Kruijff-Korbayová and Webber, 2000], where our approach was to distinguish "applicability conditions" of the implied defeasible rules in accordance to information structure. However, it remained unclear how they would be handled by a discourse update function. In this paper we argue that all the differences due to information structure can be captured formally in terms of Rooth's notion of an **alternative set** [Rooth, 1985, Rooth, 1992] and the alternative-set semantics of information structure worked out in [Steedman, 2000, Steedman, 2001]. We also extend the analysis to include concessive opposition.[2]

The paper is organized as follows. In Section 2 we summarize some existing approaches to concession, including the distinction proposed between assertional and presuppositional components of its meaning. In Section 3 we present our approach to information structure, which is the formal machinery we employ in our information-structure sensitive account of denial of expectation in Section 4, and concessive opposition in Section 5. We conclude with a summary and indication of future directions.

2 The Meaning of *although*

The distinction between **concessive opposition** and **denial of expectation** can be traced back to Robin Lakoff [Lakoff, 1971b], in her explanation of the connective *but*:[3] *but* can be used (i) in semantic opposition,

[2] We continue to omit contributions of tense, aspect and modality, under the assumption that our analysis will not be invalidated by their eventual incorporation.

[3] One of the reviewers kindly pointed out to us that an account of the French *mais* ('but') in terms of the opposition of expectation seems to be present in Oswald Ducrot's

requiring a "common topic" and semantic similarity, or (ii) in denial of expectation, without any notion of semantic opposition, but presupposing a general tendency or expectation. Using the cognitive primitives introduced in [Sanders et al., 1992], concessive opposition can be characterized as an **additive**, negative, semantic or pragmatic relation, while denial of expectation is characterized as a **causal**, negative, semantic or pragmatic relation.

2.1 A Unified Interpretation Scheme

[Grote et al., 1995] have observed that despite the diversity of concessions in their corpus of German text and in the literature, an underlying general principle can be extracted, relating propositions and implications:

> On the one hand, A holds, implying the expectation of C. On the other hand, B holds, which implies $Not - C$, contrary to the expectation induced by A.

which they capture in what they call the ABC**-scheme**, written as:

(12) i. $A > C$
  ii. $B > Not - C$

(12i) is a defeasible rule, which typically encodes general world knowledge, either a rule of cause and effect or a customary expectation. (12ii) is a defeasible rule induced from context. While A and B both hold, (12ii) is considered stronger in the given situation, hence $Not - C$ follows. One can paraphrase this as *Although A, nevertheless not-C, because B.*

Grote et al. also observed that various parts of the above ABC-scheme can be verbalized or left implicit. Notably, when A and $Not - C$ (and possibly B) are verbalized, we get denial of expectation. When A and B are verbalized (and C is either implicit in the context or is explicitly mentioned), we get concessive opposition. This is consistent with the fact we have already noted that the same utterance(s) can be interpreted as either denial of expectation or concessive opposition, depending on the context.

2.2 Assertion vs. Presupposition

[Lakoff, 1971b] also distinguished between the **assertion** and the **presupposition** of a discourse connective. Her account of *but* in the denial of expectation use was formalized by George Lakoff [Lakoff, 1971a] as:

work, and that an extensive account can be found in Jacques Jayez's work in French.

(13) S_1 *but* S_2 **asserts** the truth of both S_1 and S_2,
and **presupposes** an expectation $Exp(S_1 \supset \sim S_2)$.

[Lakoff, 1971a] also discusses the relation between presuppositions and reciprocal contrastive stress with respect to the connective *and*, together with other discourse markers such as *then*, *too* and *either*. Our own work expands this early idea, incorporating the influence of information structure.

Following these early efforts, [Karttunen, 1973] established the distinction between the **semantic** and **pragmatic** notions of presupposition. Later, [Karttunen and Peters, 1979] identified the latter with the notion of **conventional implicature** as specified in [Grice, 1975].

Semantic presupposition: sentence A semantically presupposes another sentence B just in case B is true whenever A is either true or false; in other words, the truth of B is a condition for the bivalence of A [Karttunen, 1973, p.169]

Pragmatic presupposition (conventional implicature): to presuppose something as a speaker is to take its truth for granted and to assume that the audience does the same [Karttunen, 1973, p.169]. Surface sentence A pragmatically presupposes a logical form L, if and only if it is the case that A can be felicitously uttered only in contexts which entail L [Karttunen, 1974, p.181]

[Karttunen and Peters, 1979] pointed out that most cases of presupposition discussed to-date were in fact concerned with the pragmatic notion.

The claim that causal discourse connectives have presuppositions was elaborated in [Lagerwerf, 1998]. He associated the expectations induced by causal discourse connectives with defeasible rules that might be expected but nevertheless fail to hold in the current case:

(14) *although* α β

- asserts: α' *and* β'
- (pragmatically) presupposes: $gen(\alpha') > gen(\neg\beta')$

where α' and β' stand for the propositions expressed by α and β, $>$ stands for "defeasibly implies" in Asher and Morreau's common-sense entailment [Asher and Morreau, 1991], and $gen(X)$ stands for a **generalization**, i.e., an abstraction reachable from proposition X. A similar treatment appeared independently in [Knott, 1996] and [Knott and Mellish, 1996].

Lagerwerf applied the standard presupposition tests (including embedding under negation or modal operators) and discourse context tests. The latter rely on the notion of **satisfaction of presuppositions** within a larger context defined first in [Karttunen, 1974] and subsequently elaborated by numerous authors contributing to the research on dynamic semantics. Although Lagerwerf noted difficulties getting judgements on the embedding tests, he concluded that the expectation underlying *although* α β is a presupposition, because the discourse context tests could be applied easily. But if one keeps in mind the distinction between semantic and pragmatic presupposition, one should not be surprised that the embedding tests were inapplicable, while discourse context tests are equally applicable to both semantic and pragmatic presupposition (cf. [Karttunen, 1973, p.171]).

It is clear that in speaking of discourse connectives as carrying presuppositions of the sort involved in denial of expectation, authors have the pragmatic notion corresponding to the Gricean notion of conventional implicature in mind. So, we follow [Karttunen and Peters, 1979] in using the term conventional implicature for the pragmatic notion of presupposition.

3 Information Structure and Context Updating

Our claim is that differences in the conventional implicatures associated with (6) and (7) come from differences in their **information structure** (IS), both in denial of expectation and concessive opposition. Therefore we first present our approach to IS and IS-sensitive context updating, before moving on to our IS-sensitive interpretation of concession.

3.1 Information Structure

We follow the approach to IS proposed in [Steedman, 1996, Steedman, 2000, Steedman, 2001]. Steedman's main aim is to provide an IS-sensitive compositional analysis of English sentences in categorial grammar, combining phonological and syntactic structure. Building on the findings originating in the Prague School [Firbas, 1992, Mathesius, 1975, Sgall et al., 1986], Steedman recognizes two dimensions of IS: The first defines a partitioning into **Theme**$_{is}$ and **Rheme**$_{is}$; the second is a further partitioning into **Background**$_{is}$ and **Focus**$_{is}$ within each Theme$_{is}$ and Rheme$_{is}$.[4] The latter partitioning is related to Halliday's **Given-New** dichotomy [Halliday, 1970,

[4] Alternative terms used for similar (but not identical) IS partitions in other works are Topic-Comment, Topic-Focus, Background(=Link+Tail)-Focus. We adopt Steedman's terms, but add the subscripts in Theme$_{is}$, Rheme$_{is}$ and Background$_{is}$, Focus$_{is}$ in order to avoid confusion with the other uses of the same terms.

Halliday, 1985] and concerns the distinction between elements in the sentence's meaning which contribute to distinguishing the Theme$_{is}$ and the Rheme$_{is}$ from other alternatives that the context makes available.

IS is established as a result of an interplay of factors, e.g. intonation, word order and grammatical structure. Three possible IS partitions for the string *Clyde married Bertha* are given below. Each example is presented as a reply to a question which helps to fix its IS. SMALL CAPITALS indicate words carrying a pitch accent, underlining is used to mark the Rheme$_{is}$.

(15) Q: I know Clyde has stopped dating Aretha, because of a relationship with someone else, and David is getting a divorce. What's going on?
A: CLYDE married BERTHA.

i. $(\theta\ \lambda P.\ P(^\star c))\ (\rho\ \lambda x.\ marry'(x, ^\star b))$

ii. θ-AS: $\{\exists P.\ P(c),\ \exists P.\ P(d)\}$
ρ-AS: $\{marry'(c,a),\ date'(c,b),\ marry'(c,b)\}$

(16) Q: I know Clyde has stopped dating Aretha, because he either married or started dating someone else. Who is it?
A: Clyde MARRIED BERTHA.

i. $(\theta\ \lambda x.\ ^\star marry'(c,x))\ (\rho\ \lambda Q.\ Q(^\star b))$

ii. θ-AS: $\{\exists x.\ marry'(c,x),\ \exists x.\ date'(c,x)\}$
ρ-AS: $\{marry'(c,a), marry'(c,b)\}$

(17) Q: I noticed a change in Clyde's relationship with Aretha and Bertha. What's going on between him and his girlfriends?
A: Clyde MARRIED BERTHA.

i. $(\theta\ \lambda Q.\ Q(c, ^\star b))\ (\rho\ \lambda x.\lambda y.\ ^\star marry'(x,y))$

ii. θ-AS: $\{\exists Q.\ Q(c,a),\ \exists Q.\ Q(c,b)\}$
ρ-AS: $\{date'(c,b),\ marry'(c,b)\}$

For each sentence, (i) provides a simplified **IS-partitioned logical form**, where θ and ρ are operators which "wrap" Theme$_{is}$ and Rheme$_{is}$, respectively. The asterisks on terms in the semantics indicate elements belonging to the Focus$_{is}$-part under the Background$_{is}$-Focus$_{is}$ partitioning with both Theme$_{is}$ and Rheme$_{is}$. We consider the IS-partitioned logical forms to represent the linguistic meaning of the sentences, and to serve as input for a discourse (context) **update function** described below. In (ii), we provide the Theme$_{is}$ alternative set (θ-AS) and Rheme$_{is}$ alternative set (ρ-AS), which are explained below. Pitch accents in Theme$_{is}$ entail contrast with a previous Theme$_{is}$, and the θ-AS thus contains more than one element.

Without pitch accents in Theme_{is}, and thus without contrast, the θ-AS would be a singleton set.

Elaborating on Rooth's alternative semantics [Rooth, 1992], the semantics assigned to IS in Steedman's approach is (cf. [Steedman, 2001]):

- Theme_{is} presupposes a **$\textbf{Rheme}_{is}$-alternative set** (ρ-AS).
- Focus_{is} within Rheme_{is} restricts the ρ-AS to the singleton set corresponding to the asserted proposition.
- Theme_{is} also presupposes a **Theme-alternative set** (θ-AS).
- Focus_{is} within Theme_{is} restricts the θ-AS to the singleton set corresponding to Theme_{is}.

ρ-AS corresponds to what Rooth calls the **contextual alternative set** [Rooth, 1985, Rooth, 1992]. θ-AS is a set of alternative themes with respect to the context, corresponding to what Rooth calls the **question alternative set**. The notion of alternative set is also closely related to the notion of **secondary denotation** [Karttunen and Peters, 1979].

Following [Steedman, 2001], we take ρ-AS to be a subset of the propositions supported by the context, whose characteristic function is obtained systematically from the IS-partitioned logical form: specifically, we replace the λ operator in Theme_{is} with an existential quantifier. ρ-AS is then the set of propositions that could instantiate the resulting form in the given context. θ-AS is constructed in similarly. As noted in [Steedman, 2001, p.10], alternative sets may not be exhaustively known to hearers, and in practice one would want to compute with a more abstract form.

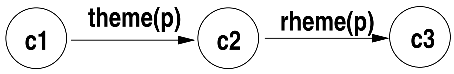
3.2 IS-sensitive Context Updating

We follow [Krifka, 1993, Kruijff-Korbayová, 1998, Steedman, 2001] in defining the updating of an input context c_1 with an IS-partitioned logical form p as comprising two phases, a **$\textbf{Theme}_{is}$ update phase** and a **$\textbf{Rheme}_{is}$ update phase**. Following [Karttunen, 1974] and current dynamic semantics work, we can then define recursively when an input context **admits** an IS-partitioned logical form (see Figure 1):

(18) c_1 admits p iff:

- c_1 admits $\theta(p)$: $c_1[\theta(p)]c_2$,
- c_2 admits $\rho(p)$: $c_2[\rho(p)]c_3$

Figure 1: IS-sensitive update of context c_1 with p: $c_1[\theta(p)]c_2[\rho(p)]c_3$



In the **Theme$_{is}$ update phase**, it is verified whether $\theta(p)$ is supported by the input context c_1.[5] This yields the context c_2 which is either the same as c_1 (if there is no contrast within $\theta(p)$) or different due to the presence of contrast in $\theta(p)$. The **Rheme$_{is}$ update phase** yields the final context c_3. The update fails when any element of the update phase is not successful.

Updating with *although* α β involves at least three phases: a sequence of two IS-sensitive updates, one clause at a time, followed by the derivation and resolution of the conventional implicatures triggered by *although*. In the next two sections, we focus on the third phase for denial of expectation (Section 4) and concessive opposition (Section 5).

4 IS-Sensitive Denial of Expectation

Building on the semantics proposed for the denial of expectation interpretation of *although* α β in [Lagerwerf, 1998, Lakoff, 1971a] and using the notion of IS-sensitivity described in the previous section, we can refine Lagerwerf's (14) as in (19), with a further addition to be given in Section 4.3:

(19) c_1 admits *although* p q iff

i. assertions: c_1 admits $p\&q$, i.e.,
c_1 admits p: $c_1[\theta(p)]c_2[\rho(p)]c_3$
c_3 admits q: $c_3[\theta(q)]c_4[\rho(q)]c_5$

ii. conventional implicature (pragmatic presupposition):
c_1 admits $p > not(q)$:
$c_1[\theta(p)]c_2[\rho(p)]c_3[\theta(q)]c_4[\overline{\rho(q)}]c_6 \ \wedge \ c_6 \neq \bot$

Here, $not(q)$ stands for a negation of q in which $\theta(q)$ is preserved and $\rho(q)$ is replaced by its complement, written as $\overline{\rho(q)}$. What is new here is that context c_4 must be updated not only by $\rho(q)$ but also by this complement.

[5] [Steedman, 2001] discusses ways in which the current Theme$_{is}$ can relate to the input context, but we don't exploit more than the simplest of these for the present examples.

4.1 Negation as "suitable alternative"

Using the notion of alternative sets, the conventional implicature in (19) can be formulated more generally as *There exists q' which is a suitable alternative to q in the given context such that normally if p then q'*:

(19ii′) conventional implicature for *although p q* (denial of expectation):
$\exists q'.\ q' \in \rho\text{-AS}(q) \ \wedge\ q' \neq q \wedge (c_1 \text{ admits } p > q')$:
$c_1[\theta(p)]c_2[\rho(p)]c_3[\theta(q)]c_4[q']c_6 \ \wedge\ c_6 \neq \perp$

where a suitable alternative to q depends on the discourse context and comes from its Rheme$_{is}$ alternative set (ρ-AS(q)). A trivial alternative to any proposition corresponding to a sentence with the main verb included in the Rheme$_{is}$ is a proposition with the opposite polarity. (19ii′) effectively means that we model the denied expectation as a **possibility**: it must be possible to update c_3 with both q and the alternative of q. The transition from c_3 via c_4 to c_6 is a hypothetical one: In dynamic semantics, it would correspond to a **test** of c_3, which succeeds unless there is contrary information in the context. Only if $c_6 \neq \perp$, the "real" update from c_1 to c_5 is successful.

Our semantics so far recognizes the role of information structure in identifying what is contextually appropriate. This we illustrate in the next section with respect to examples (6) and (7). The following section then shows that information structure plays another role as well.

4.2 Examples

(6) Although Clyde married BERTHA, he did not inherit a PENNY.

For (6), there are two possibilities for an IS-partitioning of the *although*-clause: a "narrow-focus" and a "broad-focus" reading. We will deal with each in turn. To keep the number of analyses manageable, we will consider only the broad-focus" reading of the matrix clause.

(20) Although Clyde married <u>BERTHA</u>, he <u>did not inherit a PENNY</u>.

i. IS-partitioned logical forms:
$p:\ (\theta\ \lambda x.\ marry'(c,x))\ (\rho\ \lambda P.\ P(^{\star}b))$
$q:\ (\theta\ \lambda\ Q.\ Q(c))\ (\rho\ \lambda y.\ \neg inherit'(y, money'))$

ii. Theme$_{is}$- and Rheme$_{is}$-alternative sets:
$\theta\text{-AS}(p):\ \{\exists x.\ marry'(c,x)\}$
$\rho\text{-AS}(p):\ \{marry'(c,a), marry'(c,b)\}$

θ-AS(q) : $\{\exists Q.\ Q(c)\}$
ρ-AS(q) : $\{inherit'(c, money'), \neg inherit'(c, money')\}$[6]

iii. assertions:
$c_1[\lambda x.\ marry'(c,x)]c_2[\lambda P.\ P(b)]c_3[\lambda Q.\ Q(c)]c_4$
$[\lambda y.\ \neg inherit'(y, money')]c_5$

iv. conventional implicature due to denial of expectation:
$c_1[\lambda x.\ marry'(c,x)]c_2[\lambda P.\ P(b)]c_3[\lambda Q.\ Q(c)]c_4$
$[\lambda y.\ inherit'(y, money')]c_6 \ \wedge\ c_6 \neq \perp$

That is, the update succeeds iff *In normal circumstances, if Clyde marries Bertha, it is possible for Clyde to inherit some money; Clyde marries Bertha; Clyde does not inherit any money.*

(21) Although Clyde <u>married BERTHA</u>, he <u>did not inherit a PENNY</u>.

i. IS-partitioned logical forms:
p : $(\theta\ \lambda P.\ P(c))\ (\rho\ \lambda x.\ marry'(x, {}^{\star}b))$
q : $(\rho\ \lambda y.\ \neg inherit'(y, money'))\ (\theta\ \lambda\ Q.\ Q(c))$

ii. Theme- and Rheme-alternative sets:
θ-AS(p) : $\{\exists P.\ P(c)\}$
ρ-AS(p) : $\{marry'(c,a), marry'(c,b), date'(c,b)\}$
θ-AS(q) : $\{\exists Q.\ Q(c)\}$
ρ-AS(q) : $\{inherit'(c, money'), \neg inherit'(c, money')\}$

iii. assertions:
$c_1[\lambda P.\ P(c)]c_2[\lambda x.\ marry'(x,b)]c_3[\lambda\ Q.\ Q(c)]c_4$
$[\lambda y.\ \neg inherit'(y, money')]c_5$

iv. conventional implicature due to denial of expectation:
$c_1[\lambda P.\ P(c)]c_2[\lambda x.\ marry'(x,b)]c_3[\lambda\ Q.\ Q(c)]c_4$
$[\lambda y.\ inherit'(y, money')]c_6 \ \wedge\ c_6 \neq \perp$

That is, the update again succeeds iff *In normal circumstances, if Clyde marries Bertha, it is possible for Clyde to inherit some money; Clyde marries Bertha; Clyde does not inherit any money.* So far both the assertions and conventional implicatures are the same for (20) and (21): They differ only with respect to contextual appropriateness and updating. In the next section, we show how the semantics differs as well.

[6] For simplicity, we only consider the extremes, i.e., inheriting all the money vs. not inheriting any, although there are further possibilities in between, i.e., inheriting some, much, most, etc. of the money.

4.3 Expectation Perfection

The important intuition which we have not captured so far is that the element(s) in the Rheme$_{is}$, e.g., Bertha in (20), marrying Bertha in (21) and marrying in (7), are somehow special, differentiated from their alternatives (in the given context). For example, in (20), it is not only the case that we expect that if Clyde marries Bertha he would inherit some money; (20) also suggests that Bertha is a special case: for any alternative to Bertha, we would normally expect no inheritance. Thus (7), (20) and (21) each give rise to two conventional implicatures under the denial of expectation interpretation, which can be paraphrased as:

(7′) a. In normal circumstances, if what Clyde does with Bertha is marry her, then he inherits some money.

b. In normal circumstances, if what Clyde does with Bertha is something other than marry her, then he does not inherit money.

(20′) a. In normal circumstances, if what Clyde does is marry Bertha, then he inherits some money.

b. In normal circumstances, if what Clyde does is marry someone other then Bertha, then he does not inherit money.

(21′) a. In normal circumstances, if what Clyde does is marry Bertha, then he inherits some money.

b. In normal circumstances, if what Clyde does is something other than marry Bertha, then he does not inherit money.

We capture this intuition by adding a second defeasible rule, given here as (22b) in addition to (19ii′), repeated here as (22a). (22a) says that there is a suitable alternative q' to q such that if p then in normal circumstances q'. (22b) says that all suitable alternatives p' to p are such that if p' then in normal circumstances q. (For a schematic presentation, see Figure 2).

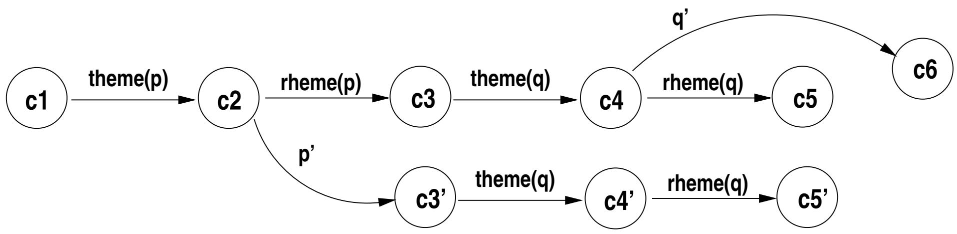
(22) conventional implicatures for *although p q* (denial of expectation):

a. $\exists q'.\ q' \in \rho\text{-AS}(q)\ \wedge\ q' \neq q \wedge (c_1 \text{ admits } p > q')$:
$c_1[\theta(p)]c_2[\rho(p)]c_3[\theta(q)]c_4[q']c_6\ \wedge\ c_6 \neq \perp$

b. $\forall p'.\ p' \in \rho\text{-AS}(p)\ \wedge\ p' \neq p \wedge (c_1 \text{ admits } p' > q)$:
$c_1[\theta(p)]c_2[p']c_3{}'[\theta(q)]c_4{}'[\rho(q)]c_5{}'\ \wedge\ c_5{}' \neq \perp$

We call the additional defeasible rule in (22b) **expectation perfection**, because it is parallel to the notion of **conditional perfection** proposed in [Geis and Zwicky, 1971] to capture the fact that humans tend to perfect

Figure 2: IS-sensitive context update for denial of expectation.



conditionals to bi-conditionals. Expectation perfection leads to the following additional implicatures in the analyses in (20) and (21):

(20iv$'$) expectation perfection for (20):

$$c_1[\lambda x.\ marry'(c,x)]c_2[\lambda P.\ P(a)]c_3{}'[\lambda\ Q.\ Q(c)]c_4{}'$$
$$[\lambda y.\ \neg inherit'(y, money')]c_5{}'\ \wedge\ c_5{}' \neq\perp$$

That is, the additional condition is that in a context in which Aretha is an alternative to Bertha with respect to marrying, the update succeeds iff *In normal circumstances, if Clyde marries Aretha, it is possible that Clyde does not inherit any money.*

(21iv$'$) expectation perfection for (21):

$$c_1[\lambda P.\ P(c)]c_2[\lambda x.\ date'(x,b)]c_3{}'[\lambda\ Q.\ Q(c)]c_4{}'$$
$$[\lambda y.\ \neg inherit'(y, money')]c_5{}'\ \wedge\ c_5{}' \neq\perp$$
$$c_1[\lambda P.\ P(c)]c_2[\lambda x.\ marry'(x,a)]c_3{}''[\lambda\ Q.\ Q(c)]c_4{}''$$
$$[\lambda y.\ \neg inherit'(y, money')]c_5{}''\ \wedge\ c_5{}'' \neq\perp$$

That is, the additional condition is that in a context in which dating Bertha and marrying Aretha are alternative things that Clyde might do, the update succeeds iff *In normal circumstances, if Clyde dates Bertha or marries Aretha, it is possible that Clyde inherits money.*

The analysis of (7) completes the demonstration of our approach.

(7) Although Clyde <u>MARRIED</u> Bertha, he <u>did not inherit a PENNY</u>.

i. IS-partitioned logical forms:

$p:\ (\theta\ \lambda P.\ P(c,b))\ (\rho\ \lambda x.\lambda y.\ marry'(x,y))$

$q:\ (\theta\ \lambda\ Q.\ Q(c))\ (\rho\ \lambda z.\ \neg inherit'(z, money'))$

ii. Theme$_{is}$- and Rheme$_{is}$-alternative sets:
θ-AS(p) : $\{\exists P.\ P(c,b)\}$
ρ-AS(p) : $\{marry'(c,b), date'(c,b)\}$
θ-AS(q) : $\{\exists Q.\ Q(c)\}$
ρ-AS(q) : $\{inherit'(c,money'), \neg inherit'(c,money')\}$

iii. assertions:
$c_1[\lambda P.\ P(c,b)]c_2[\lambda x.\lambda y.\ marry'(x,y)]c_3[\lambda\ Q.\ Q(c)]c_4$ $[\lambda z.\ \neg inherit'(z,money')]c_5$

iv. conventional implicatures:
a. $c_1[\lambda P.\ P(c,b)]c_2[\lambda x.\lambda y.\ marry'(x,y)]c_3[\lambda\ Q.\ Q(c)]c_4$ $[\lambda y.\ inherit'(y,money')]c_6 \ \wedge\ c_6 \neq \perp$
b. $c_1[\lambda P.\ P(c,b)]c_2[\lambda x.\lambda y.\ date'(x,y)]c_3'[\lambda\ Q.\ Q(c)]c_4'$ $[\lambda y.\ \neg inherit'(y,money')]c_5' \ \wedge\ c_5' \neq \perp$

That is, the update succeeds iff *In normal circumstances if Clyde marries Bertha, it is possible for Clyde to inherit some money; In normal circumstances, if Clyde dates Bertha, it is possible for Clyde not to inherit any money; Clyde marries Bertha; Clyde does not inherit any money.*

5 IS-Sensitive Concessive Opposition

The possibility of conventional implicature being involved in concessive opposition was discussed in [Lagerwerf, 1998]. Starting from the reasonable assumption that if there is a (pragmatic) presupposition (conventional implicature), it should involve the tercium comparationis (TC), Lagerwerf considered the possibility that what is presupposed might be (i) the TC itself, (ii) the negation of the TC, (iii) the conjunction of the TC and it negation, (iv) their disjunction, or (v) the conjunction of the possibility of TC and the possibility of the negation of the TC. He concluded that concessive opposition does not involve presupposition. What we want to show is that it does: First, the TC is conventionally implicated as an open issue, and second, each of the relata conventionally implicates an expectation, and these expectations lead to opposite conclusions with respect to the TC.

Consider the following examples: the question in (23) establishes the TC as the open issue whether Clyde is happy, and (7, 20, 21) are possible responses. We are concerned with the IS-sensitivity of concessive opposition and the conventional implicatures that the response give rise to. The latter are paraphrased in (a) through (d) for each example.[7]

[7]However artificial, it is convenient to continue to use the same sentence(s) because we

(23) Q. Is Clyde HAPPY?

(7) Although Clyde MARRIED Bertha, he did not inherit a PENNY.

a. In normal circumstances, if what Clyde does with Bertha is to marry her, then Clyde is happy.

b. In normal circumstances, if what Clyde does with Bertha is something else than marrying her, then Clyde is not happy.

c. In normal circumstances, if what happens to Clyde is that he does not inherit a penny, then Clyde is not happy.

d. In normal circumstances, if what happens to Clyde is something else than not inheriting a penny, then Clyde is happy.

(20) A. Although Clyde married BERTHA, he did not inherit a PENNY.

a. In normal circumstances, if Clyde marries Bertha, then Clyde is happy.

b. In normal circumstances, if Clyde marries someone else than Bertha, then Clyde is unhappy.

c. same as (23c)

d. same as (23d)

(21) Although Clyde married BERTHA, he did not inherit a PENNY.

a. In normal circumstances, if what Clyde does is marry Bertha, then Clyde is happy.

b. In normal circumstances, if what Clyde does is something else than marry Bertha, then Clyde is not happy.

c. same as (23c)

d. same as (23d)

Given that the matrix clause in concessive opposition has a stronger argumentative force, the polarity of the answer in all cases depends on whether we take Clyde's not inheriting any money to entail that he is happy or unhappy. (Here we have chosen the latter.) Since we have kept the matrix clauses the same, their analyses and thus the answers are the same in all

have already presented their detailed IS analysis. Naturally-occurring examples however are not rare – for example, the following from a FAQ sheet on PERL:

> Q: Can I use Perl regular expressions to match balanced text?
> A: Although Perl regular expressions are more powerful than "mathematical" regular expressions, they still aren't powerful enough....

cases. Where the examples differ is what is responsible for the opposite expectation derived from the *although*-clause. As with denial of expectation, it is the Rheme_{is} in each case that determines the special case for which the opposite expectation holds. For any of the Rheme_{is}-alternatives, there is no such opposite expectation.

How can we formalize the TC? According to [Hamblin, 1973], a question determines a set of **potential answers**. A further connection between the set of potential answers and Rooth's notion of contextual alternative set has been made in [Rooth, 1992]. It is this alternative set, i.e., our ρ-AS, that we take to be the TC in the presence of an explicit question.

Both yes/no and wh-questions can establish a TC. For example, (25) in response to (24Q1-Q3) can be interpreted as having the same TC, (26).

(24) Q1 Shall we go to King Tsin?
Q2 Shall we go to King Tsin or to China First?
Q3 Which restaurant shall we go to?

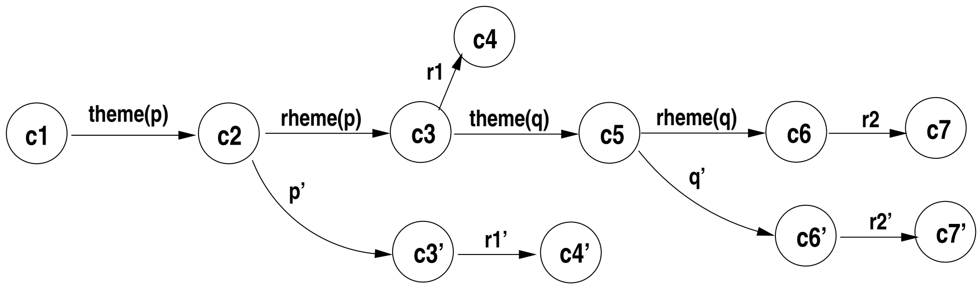
(25) Although King Tsin has great mu shu pork, China First has good dim sum.

(26) $\{go\_to'(speaker_+, kt), go\_to'(speaker_+, chf)\}$.

In the absence of an explicit question, the TC has to be inferred from the context and the relata. We model this by the TC being conventionally implied as a contextually available alternative set. Using the notion of IS-sensitivity described earlier and employing alternatives and expectation perfection as we did for denial of expectation, we can define when a context admits the concessive opposition interpretation of *although* α β (see also Figure 3):

(27) c_1 admits *although* p q iff
i. assertions: c_1 admits $p\&q$ (as with denial of expectation)
ii. conventional implicatures for concessive opposition:
a. $\exists R.\ R = \{r_1, r_2, \ldots, r_n\}$ is a *contextual alternative set*
b. (c_1 admits $p > r_1$ $\wedge$ (c_3 admits $q > r_2$):
$c_1[\theta(p)]c_2[\rho(p)]c_3[r_1]c_4 \ \wedge \ c_4 \neq\perp \ \wedge$
$c_3[\theta(q)]c_5[\rho(q)]c_6[r_2]c_7 \ \wedge \ c_7 \neq\perp$
c. $\exists r_1', r_2' \in R.\ r_1' \neq r_1 \ \wedge r_2' \neq r_2 \ \wedge \ r_1' \neq r_2' \ \wedge$
$\forall p'.\forall q'.\ p' \in \rho - AS(p) \wedge p' \neq p \wedge q' \in \rho - AS(q) \wedge q' \neq q \wedge$
(c_1 admits $p' > r_1'$) $\wedge$ (c_1 admits $q' > r_2'$):
$c_1[\theta(p)]c_2[p']c_3'[r_1']c_4' \ \wedge \ c_4' \neq\perp \ \wedge$
$c_5[q']c_6'[r_2']c_7' \ \wedge \ c_7' \neq\perp$

Figure 3: IS-sensitive context update for denial of expectation.



That is, a contextual alternative set R is conventionally implicated; p defeasibly implies some member of R; every alternative p' to p defeasibly implies the complement of R; similarly for q, which defeasibly implies a member of R distinct from the member implied by p. A minimal set R contains just two alternatives, r_1 and r_2, and then $r_1{}' = r_2$ and $r_2{}' = r_1$. R reflects the TC, which can be established by the preceding context fully or partially. (If it is implicit, the interpreter must figure it out, where the relata in the concessive opposition relation can provide important clues.)

We illustrate (27ii) in full for one example:

(20) Although Clyde married <u>BERTHA</u>, he <u>did not inherit a PENNY</u>.

i. IS-partitioned logical forms: as in (7i)

ii. Theme$_{is}$- and Rheme$_{is}$-alternative sets: as in (7ii)

iii. assertions: as in (7iii)

iv. conventional implicatures for concessive opposition:

a. $\exists R.\ R = \{r_1, r_2\}$

b. $c_1[\lambda x.\ marry'(c,x)]c_2[\lambda P.\ P(b)]c_3[r_1]c_4\ \wedge c_4 \neq \perp$

c. $c_3[\lambda Q.\ Q(c)]c_5[\lambda y.\ \neg inherit'(y, money')]c_6[r_2]c_7\ \wedge\ c_7 \neq \perp$

d. $c_1[\lambda x.\ marry'(c,x)]c_2[\lambda P.\ P(a)]c_3{}'[r_1{}']c_4{}'\ \wedge c_4{}' \neq \perp$

e. $c_1[\lambda Q.\ Q(c)]c_5[\lambda y.\ inherit'(y, money')]c_6{}'[r_2{}']c_7\ \wedge\ c_7{}' \neq \perp$

The update succeeds, iff *In normal circumstances, if Clyde marries Bertha it is possible that* r_1*; In normal circumstances, if Clyde marries Aretha it is possible that* $r_1{}'$*; In normal circumstances, if Clyde does not inherit money it is possible that* r_2*; In normal circumstances, if Clyde inherits money it* *is possible that r_1'; Clyde marries Bertha and Clyde does not inherit any money.* In the presence of an explicit question as in (23), we take the minimal alternative set containing just the alternatives r_1 (e.g., $happy(c)$.) and r_2 (e.g., $unhappy(c)$), while $r_1' = r_2$ and $r_2' = r_1$. Even without an explicit question, the preceding context may establish an alternative set which can serve as the TC. Otherwise, a suitable alternative set has to be accommodated.

To conclude this section, we return to Grote et al.'s ABC-scheme (Section 2.1). When we replace negation with the notion of a suitable alternative (Section 4.1) and add expectation perfection (Section 4.3), we get the following extended scheme:

(28) augmented ABC-scheme

i. $A > C$ (as before)

ii. $B > C'$ (a suitable alternative instead of negation)

iii. $A' > C'$ (expectation perfection)

iv. $B' > C$ (expectation perfection)

where X' is a suitable alternative to X. In denial of expectation, *although* α β verbalizes A (in α) and C' (in β), C and C' are members of the Rheme$_{is}$-alternative set corresponding to β, and A and A' are members of the Rheme$_{is}$-alternative set corresponding to α. In concessive opposition, *although* α β verbalizes A (in α) and B (in β), C and C' are members of the contextual alternative set corresponding to the tercium comparationis, A and A' are members of the Rheme$_{is}$-alternative set corresponding to α, and B and B' are members of the Rheme$_{is}$-alternative set corresponding to β.

6 Summary

In our earlier paper [Kruijff-Korbayová and Webber, 2000], we identified the following further steps to be accomplished in the larger enterprise of understanding how sentence-level semantic phenomena, like IS, interact with discourse-level phenomena, such as discourse relations, which in turn can be signaled in part by discourse connectives:

- to look at other connectives and work out additional examples of the ones we have already considered

- to consider the interplay of intonation and word order in relation to discourse connectives

- to investigate the relation between IS and local vs. global accommodation of presuppositions.

In this paper, we have continued along the lines specified above: (1) We clarified what the relevant notion of presupposition is in concession, namely, that we are concerned with the pragmatic presupposition, which corresponds to the Gricean notion of conventional implicature. (2) We revised and improved the IS-sensitive analysis of the denial of expectation use of *although*, fully casting it in terms of contextual alternative sets. (3) We proposed an IS-sensitive analysis of another sense of *although*, namely concessive opposition; this analysis uses the same formal machinery as the analysis of the denial of expectation relying on alternative sets. Also the tercium comparationis is represented as a contextual alternative set.

We hope in the coming year to make a small implementation (probably using Johan Bos' DORIS system[8]) for individual clauses and their IS, and then for complex sentences or sequences thereof related by connectives.

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[8]See `http://www.coli.uni-sb.de/~bos/doris/`

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