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Coherence and Structure in Text and Discourse

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1.1 Textual coherence versus discourse structure

Coherence is one of the most general and most widely discussed concepts in the study of text and discourse. In spite—or perhaps because—of its central status, the concept of coherence has many different and often incompatible definitions and connotations. For text linguistics or psycholinguistics with their focus on the representation and processing of information in written texts, coherence is predominantly a matter of semantics and domain knowledge, while various brands of speech act and dialogue analysis describe coherence in terms of intentions and interactional structures. I will argue in subsection 1.1 that the focus on and restriction to rather extreme discourse genres, such as exposition on the one hand or highly interactive dialogues on the other, causes an overemphasis on genre-specific characteristics at the expense of general properties common to all kinds of discourse. Theories of discourse coherence, then, should be built and tested for a sufficiently diverse variety of discourse types, especially discourse that combines monologue and dialogue features. In sections 3 and 4 of this paper, I will present a framework for such a theory and two corpus-analytical studies that support the notion that coherence should be thought of as consisting of three parallel components: ideational (semantic) structure, rhetorical structure, and sequential (or segment) structure.

1.1.1 Coherence in Text and Dialogue

In order to explore the differences between the data used in text-oriented and in dialogue-oriented approaches, let us compare a typical written genre like

exposition and, to keep things reasonably compatible, an information dialogue.

Let us begin with the written genre. The writer of an expository text starts out with the subject matter and with a model of the intended readers for whom those contents are to be described and explained. The selection of background material and details appropriate for that readership is the basis for an overall plan with hierarchically and sequentially ordered subtopics. The writer can realize this plan in any order, can spend extra time on some segments, and, most importantly, can and usually will revise the realization or the plan itself locally and at higher levels.

Consider now an information dialogue, that is, the interaction between an information seeker and an expert who can provide (some of) the information sought. The expert has the same kind of knowledge base as the writer of the expository text, and may have some model of the typical information seeker or of one specific person from earlier interactions. But the expert now learns about the interlocutor's specific information needs during the interaction. The expert's plans must therefore be developed and revised on the fly in response to the information seeker's queries and reactions.

Table 1 summarizes how well-planned written texts and highly interactive discourse differ in process and structure. The juxtaposition of these extremes illustrates why approaches based on data from one of these discourse types are unlikely to be useful in describing and explaining the other extreme.

Returning to the comparison of expository texts and information dialogues, let us now consider how the salience of certain genre-specific characteristics determines and restricts the scope of approaches that are tailored to just that genre.

The most compelling organizing principle of descriptive or expository prose is its semantic coherence, and that is what many investigators of these genres have restricted their attention to (see for instance Meyer 1975, McKeown 1985, and the contributions to Britton and Black 1985). But even authors of expository texts also express attitudes and opinions, they involve the reader with questions, suggestions, and so forth, and, most importantly, they chunk the information into relatively independent digestible bits that need not always have a clear coreferential, temporal, or causal relationship. Similar arguments apply to narrative prose, which is often analyzed exclusively in terms of the story plot, ignoring the rhetorical effects of the order and manner of presentation and the narrator's meta-communicative or evaluative commentary (for discussions of those elements see for instance Polanyi 1985, Redeker 1986, Bouwhuis & Bunt, 1994).

In dialogues, intentions play such a central role that they could hardly fail to attract researchers' attention. But they are usually modelled at the level of individual utterances (e.g. Cohen & Perrault 1979, Appelt 1985, Airenti, Bara & Colombetti 1989, Bunt 1989, 1995, Bilange, 1991) with no consideration of higher-level speaker goals like, for instance, justifying a conclusion, that

Table 1.1: *Differences between written text and interactive discourse*

Expository Text	Information Dialogue
PROCESSING CHARACTERISTICS	
speaker/author constant	alternating speakers
integrity ('off-line production')	interruptability ('on-line production')
hierarchy of communicative intentions	negotiation and revisions of intentions
incremental growth of common ground	revisions of common ground
STRUCTURAL CHARACTERISTICS	
Units	
(para-)linguistically defined units, i.e., clause, sentence, paragraph	functionally defined units, i.e., act/move, turn, exchange
Acts	
mainly INFORM	REQUEST, INFORM, CONFIRM, etc.
Relations	
mainly propositional (semantic organization)	mainly interactional (preference organization)

may require multiple, purposefully interrelated utterances (cf. Paris 1991: 64; Moore & Paris 1993). The tightest coherence links in dialogues exist between questions and answers and other so-called *adjacency pairs* or more extended *exchange patterns* (Schegloff & Sacks 1973, Clark & Schaefer 1989). Many investigators choose to describe dialogues exclusively in terms of such structures, ignoring the fact that speakers often produce internally-structured longer contributions, which cannot be adequately described in such a system (for this and related issues see Clark, 1996, who shows with great precision and detail how interactional phenomena arise from the inherently collaborative nature of language use).

The restriction to one extreme form of discourse, then, affects not only the generalizability to other types of talk or writing. The well-intended tailoring of an account to a narrowly-defined discourse genre tends to limit the investigator's attention to that genre's most salient typical characteristics. As a consequence, such an account often fails to be descriptively adequate even for the target genre itself as soon as some variety of naturally occurring instances is considered.

In sections 2 and 3 of this paper, I will discuss various approaches that have begun to take the multi-functionality of discourse into account. The first

group, the coherence relations approaches, originated in the analysis of written texts, while the second group of approaches developed from the study of spoken interaction.

1.2 Coherence Relations

A widely accepted current paradigm for the description of textual coherence is a group of approaches that describe text organization in terms of *coherence relations, rhetorical relations,* or *discourse structure relations* (for an overview of recent proposals see Maier and Hovy 1991). Following Hobbs (1979, 1990), I will use the term *coherence relations* for generic reference to all these relations.

The *coherence-relations* paradigm was developed for well-organized written texts. Those texts can usually quite uncontroversially be devided into successively smaller segments down to the level of the clause, yielding a hierarchical structure (Hobbs 1990: 111). The paradigm's central assumption is that the relations between the segments can be classified into a fixed, limited number of types. I will present a few particularly successful or promising approaches in this paradigm, before discussing some core assumptions and the status and use of the theoretical concept 'coherence relation'.

1.2.1 Definitions of Coherence Relations

Initially, coherence relations were limited to the description of propositional relations between clauses and larger discourse segments, for example, *conjunction, causation, alternation, temporal overlap/succession, contrast* and so forth (Grimes 1975, Longacre 1976, Meyer 1975). Meanwhile, more elaborate systems have been developed that also accommodate pragmatic relations like *claim-evidence, thesis-antithesis, problem-solution, request-justification,* and so forth (e.g., Hovy et al. 1992; Mann & Thompson 1988; Mann, Matthiessen & Thompson 1992; Martin 1992; Sanders, Spooren & Noordman 1992, 1993).

Rhetorical Structure Theory

The most explicit and most widely used system of cohernce relations is Mann and Thompson's Rhetorical Structure Theory (RST). The 24 relations defined in Mann and Thompson (1988) are listed in Table 2.

All RST relations are binary, except for *joint* and *sequence*, which may have more than two constituents. *Joint, sequence,* and *contrast* are paratactic, so-called multinuclear relations; all others are hypotactic, that is, they consist of a nucleus and a satellite, where the nucleus is closer to the purpose of the text or segment, and the satellite has a more supportive function.

The RST relations are not defined in terms of some linguistic property of the text or the segments involved, but crucially appeal to the analyst's intuition about the writer's purposes. Each definition contains a stipulation about the *intended effect* of the combined segment. Depending on the context of use,

Table 1.2: *Rhetorical Relations in RST*

Subject Matter Relations	Presentational Relations
Non-Volitional Cause/Result	Evidence (increases belief)
Volitional Cause/Result	Justify (increases acceptance)
Condition, Otherwise	Enablement (increases ability)
Solutionhood, Purpose	Motivation (increases desire)
Circumstance, Elaboration	Background (increases understanding)
Interpretation, Evaluation	Concession (increases positive regard)
Contrast	Antithesis (increases positive regard)
Joint, Sequence	
Restatement, Summary	

example (1a) below can be analyzed in three different ways, as illustrated by (1b) through (1d). It can be a *joint* relation if the whole segment is to be read as giving details on the flight (1b); it can be a *non-volitional cause* relation if paraphrased as (1c), or an *evidence* relation as in (1d), if the author is reporting a conclusion or arguing for a claim (that the plane will land in Paris).

(1) a. This flight takes 5 1/2 hours. There's a stop-over in Paris.
b. This flight takes 5 1/2 hours, and there's a stop-over in Paris.
c. This flight takes 5 1/2 hours because there's a stop-over in Paris.
d. This flight takes 5 1/2 hours. So there's a stop-over in Paris.

When coherence relations are used for text-analytical purposes, as in Mann and Thompson's RST, the level of abstraction at which the relations are defined is determined by the analysts' intuitions. Each type of coherence relation in that system describes an identifiable class of instances with some common characteristic that distinguishes them from other instances. The resulting list (see Table 2) contains some relations of a general cognitive nature, such as *cause/result* relations, which are known to be deeply engrained in all areas of our perception and thinking. Others, namely *restatement*, *summary*, and the *presentational relations*, are inconceivable outside of a communication context. Following Halliday's (e.g. 1985) distinction of three metafunctions of language, the latter group of relations can be divided into *interpersonal* and *textual* relations, contrasting with *ideational* relations (Maier & Hovy 1991, Hovy et al. 1992, Lavid & Maier 1992).

A taxonomic approach

Another attempt to systematize the set of coherence relations is presented by Sanders, Spooren, and Noordman (1992, 1993). In this approach, twelve classes

of coherence relations are derived from four binary dimensions, which are postulated as cognitive primitives (see Table 3). The *basic operation* involved can be additive (simple logical conjunction) or causal; the *source* can be semantic or pragmatic; the *order* of a causal relation can be basic, that is, corresponding to the direction of causation, or non-basic; and the *polarity* of the relation, finally, can be positive or negative.

Table 1.3: *Sanders et al.'s (1992) Twelve Classes of Coherence Relations*

		Basic Oper.	Source	Order	Pol.
1	Cause/Consequence Condition/Consequence	causal	sem	basic	+
2	Contrastive Cause/ Consequence	causal	sem	basic	−
3	Consequence/Cause Consequence/Condition	causal	sem	non-basic	+
4	Contrastive Consequence/ Cause	causal	sem	non-basic	−
5	Argument/Claim Instrument/Goal Condition/Consequence	causal	prag	basic	+
6	Contrastive Argument/ Claim	causal	prag	basic	−
7	Claim/Argument Goal/Instrument Consequence/Condition	causal	prag	non-basic	+
8	Contrastive Claim/ Argument	causal	prag	non-basic	−
9	List	additive	sem	*n.a.*	+
10	Opposition Exception	additive	sem	*n.a.*	−
11	Enumeration	additive	prag	*n.a.*	+
12	Exception	additive	prag	*n.a.*	−

Examples (2) through (5) illustrate these four dimensions. Notice that the sentence 'This flight takes 5 1/2 hours because there's a stop-over in Paris' represents the combination of *causal, semantic, non-basic,* and *positive*, and thus falls into Sanders et al.'s category 3, *consequence/cause* (see Table 3).[1]

(2) *Basic Operation: additive*

[1] Sanders (1992) shows how further subclassification can be achieved by introducing a list of semantic criteria like hypotheticality and volitionality, that yield not only the subclasses in Table 3, but also the complete set of RST relations.

This flight takes 5 1/2 hours, and there's a stop-over in Paris.
Basic Operation: causal
This flight takes 5 1/2 hours because there's a stop-over in Paris.

(3) *Source of Coherence: semantic*
This flight takes 5 1/2 hours because there's a stop-over in Paris.
Source of Coherence: pragmatic
This flight takes 5 1/2 hours. So there's a stop-over in Paris.

(4) *Order of causal relation: basic*
There's a stop-over in Paris; therefore this flight takes 5 1/2 hours.
Order of causal relation: non-basic
This flight takes 5 1/2 hours because there's a stop-over in Paris.

(5) *Polarity: positive*
This flight takes 5 1/2 hours because there's a stop-over in Paris.
Polarity: negative
This flight is faster, although it has a stop-over, too.

The dimensional structure of this coherence model allows strong empirical claims about the cognitive separability of the postulated categories. If two types of coherence relations differ on only one of the four dimensions, they should be very similar and they should be confused more often than classes that differ on two or three dimensions (a difference on all four dimensions cannot occur because *order* is irrelevant for additive relations). Sanders et al. (1992) present evidence that coders can reliably identify the twelve classes of relations and that almost all misclassifications deviated from the intended class on only one dimension. This pattern was not induced by the coders' knowledge of the twelve categories: it reoccurred in a clause-combining task, where writers had to supply conjunctions connecting two sentences (Sanders et al. 1992) and in a card-sorting task (Sanders, Spooren & Noordman 1993).

Coherence relations have been found very useful for the analysis of written texts (e.g., Abelen, Redeker & Thompson 1993; Fox 1987; Vander Linden, Cumming & Martin 1992; Mann, Matthiessen & Thompson 1992; Mann & Thompson 1988; Van der Pool 1995; Sanders 1992; Sanders & Van Wijk 1996) and in text generation (e.g. Hovy 1991, Hovy et al. 1992; Vander Linden & Martin 1995; Moore 1989; Moore & Paris 1993; Paris 1991; Rösner & Stede 1992). Important theoretical and practical issues, however, remain unresolved or controversial. There is still much debate about the theoretical status of the concept of 'coherence relations' and their role in human or computational discourse processing (see section 2.2). Another open question concerns the applicability of coherence relation approaches to a wider range of texts, including interactive discourse (see section 3.1).

1.2.2 Coherence relations as theoretical concepts

Coherence relations are static concepts that attribute certain meanings or communicative effects to the combination of (stretches of) utterances in a connected

discourse. The relations are defined entirely in terms of properties of the discourse segments involved. Contextual information (e.g. about the genre or register or a model of the interlocutor) is implicitly used in RST when the analyst determines the intended effect of a combination of 'text spans'. In the cognitive-psychological approach of Sanders et al., it is not clear if and how such information could be accounted for at all. They define coherence relations very broadly as "an aspect of meaning of two or more discourse segments that cannot be described in terms of the meaning of the segments in isolation" (Sanders et al. 1992: 2), but do not specify what other information (if any) outside the segments themselves contributes to this 'extra' meaning. The text analysis procedure developed by Sanders, Van Wijk, and Van der Pool (Van der Pool 1995; Sanders 1992: ch.5; Sanders & Van Wijk 1996) is expressly designed to ignore contextual influences except for a few bits of genre and domain information; but it achieves this by keeping the coherence analysis extremely lean (essentially restricted to dominance and succession relationships).

Discourse descriptions in terms of coherence relations occupy an intermediate position between the most abstract conceptual level of intentions and effects associated with discourse segments, and more specifically linguistic descriptions of discourse structure in terms of cohesive devices such as connectives or discourse markers (cf. Bateman & Rondhuis 1994). This makes coherence relations very attractive, for instance, for discourse generation (though the exact nature of the relationship between intentions and coherence relations is still a matter of debate; see e.g. the position statements in Rambow 1993).

In theories of human discourse processing, the intuitive plausibility of descriptions in terms of coherence relations entails the danger of reification: Coherence relations are easily mistaken for 'real' mental entities (i.e., cognitive representations or procedures) instead of theoretical constructs we find useful in describing and theorizing about discourse. The ('object level') use of language then gets confused with the meta-level of talking about language.

But even if we avoid the pitfall of reification, it seems unlikely that coherence relations could play a useful role in a process model of discourse understanding. This is due to the static nature of coherence relations. As structures or procedures associated with particular characteristics attributable to certain combinations of discourse segments, they are conceptually separated from the production or understanding of the individual segments and from the contextual factors that co-determine their 'extra' meaning and effect. The informational richness of those other processes, I want to argue, leaves little room for a substantial contribution from coherence relations.

Note, first of all, that coherence processing has to interact with sentence processing (e.g. with respect to anaphora resolution). This interaction could be realized by a simultaneous constraint satisfaction process: The separate contributions from contextual factors and individual utterances or sentences could be matched with and interpreted to be consistent with the closest-fitting

coherence relation, thus allowing coherence processing and comprehension of the segments to proceed in parallel.

Yet, attractive as such a model may sound, it is doomed, I will suggest, to degenerate coherence relations to post-hoc classifications that add little more than a convenient label to a relationship that is essentially determined by other factors. Take for instance Hobbs et al.'s (1993: 108) definition of the coherence relation *Explanation*:

> $(\forall e1,e2)cause(e2,e1) \supset Explanation(e1,e2)$
> That is, if what is asserted by the second segment could cause what is asserted by the first segment, then there is an explanation relation between the segments. In explanations, what is explained is the dominant segment, so the assertion of the composed segment is simply the assertion of the first segment.

What this coherence relation gives us in excess of the already known (or assumed) causal relation is the stipulation that "the assertion of the composed segment is [...] the assertion of the first segment." The main problem with this definition is that the condition is much too weak. For instance, it would seem to admit as *Explanation* cases where a segment expressing a result is produced as evidence for the assertion in the second segment as in example (6), in which case the second segment should be seen as dominant and not, as Hobbs et al.'s definition would have it, the first.

(6) His car is gone. He has left!
(intended reading: ... Therefore I assume/conclude that he has left)

We might try to accommodate this counterexample by giving the *Evidence* relation priority over the *Explanation* relation or, more generally, giving priority to pragmatic (epistemic, hearer/reader-oriented) relations over purely semantic relations.[2] But there are other cases where no such pragmatic relation is present and the postulated dominance of the result segment would still seem inadequate. Consider (7):

(7) Ann is so happy! She finally got the promotion she's been hoping for!

This is a straightforward result-cause relation: The speaker describes an emotional state and then tells us what it is that has caused this state.[3] According to the definition, then, the relation *Explanation* applies and joins the

[2] For a broader discussion of issues involved here see Wilensky (1994), who argues that discourse understanding is not about 'What Is True in the World' but 'What is Reasonable to Say'.

[3] Note that Hobbs et al.'s discussion elsewhere in the paper shows that *cause* in their definition is to be understood as including 'mental causes', i.e. reasons and 'causes' of emotional reactions.

segments to yield the assertion that Ann is happy. But clearly the main point of this fragment is more likely to be the news about the promotion than Ann's reaction to it (this can be shown by a summarization test: "?? Bill called and told me that Ann was happy." / "... that Ann finally got that promotion.").

If we wanted to prevent the *Explanation* relation from applying in such cases, we could try and add to its definition something like a constraint on the relative newsworthiness of the assertions in the two segments. But then we are already getting dangerously close to eliminating any relevant contribution of the coherence relation to the construction of the discourse representation: We are stipulating on other grounds exactly the one bit of information we were getting out of applying the coherence relation! But if we seem to need all the relevant information in order to decide whether a particular coherence relation holds, then why bother to classify certain constellations under particular coherence relation labels at all?

Coherence relations thus do not seem to provide a useful level of description for on-line discourse processing and should best be considered convenient shorthand notations for descriptive or comparative text analysis, or for use in text generation systems. What is needed for modelling the incremental construction of a discourse representation is a much richer and more linguistically driven description of the changes an utterance causes in the representation of its (full) immediate context (i.e. not just the previous utterance or segment, but also situational and genre information). Such a model will have to allow for multiple (i.e., semantic and pragmatic) relations between discourse segments to hold simultaneously (see section 3.2).

1.3 Discourse Structure

In this section I will argue that the set of coherence relations has to be extended in order to account for the segmental structure of discourse (section 3.1) and that a theory of discourse structure should allow for the presence of multiple relations between any two discourse units (section 3.2). I will then present a model that embodies these two desiderata, the Parallel-Components Model (section 3.3).

1.3.1 Discourse Segment Relations

Rhetorical Structure Theory and most other coherence relation approaches explicitly or implicitly embrace the assumption that coherence relations apply recursively, binding each and every clausal or larger unit to at least one other unit until everything is connected at the highest level of the text structure. But global text structuring often involves conventionalized overall structures, with otherwise rather unrelated (clusters of) paragraphs constituting a coherent text of a particular type or genre (see, e.g., Lavid 1993, Rothkegel 1993). It is not surprising, then, that the use of coherence relations in discourse generation systems has generally been restricted to paragraph-size units (e.g. Hovy 1991) or

extended turns (Moore 1989, Fawcett & Davies 1992, Maier & Sitter 1992) that are semantically and intentionally coherent and represent processing units in human language use (Chafe 1980, 1987; Zadrozny & Jensen 1991).

Other examples where paragraph-like units enter into global structures of a different kind are everyday conversations. In addition to complex exchange structures, they contain interruptions, back-tracking, locally occasioned topic shifts (e.g., *that reminds me*), and so forth. Approaches that aim at accommodating these global-structure phenomena are presented by Fawcett and Davies (1992), Hovy et al. (1992) and Maier and Sitter (1992).

The problem, however, is not simply one of scale, with global structures requiring a different kind of organization. Relations not commonly included in the class of coherence relations can occur at local levels, too. The paragraph-like units in spontaneous discourse (Chafe 1980, 1987), for instance, are not only embedded in genre-specific global structures or in exchange structures. They are often themselves interspersed with parenthetical segments that contain the speaker's commentary or some extra background information (Polanyi 1988, Redeker 1990, 1991). Example (8), translated from a Dutch television interview with Annie M.G. Schmidt, writer of children's books, illustrates.

(8) a. but we had a seamstress
b. and we were calling her Mietje.
c. But I think we were calling everyone Mietje back then
d. you know, I don't know why,
e. but anyway,
f. so that was also a Mietje.
g. And uh- she was from Belgium.
h. And there were- she was a Belgian refugee,
i. 'cause during during the war,
j. during the First World War
k. all those refugees were coming from Belgium,
l. and they were coming to Zeeland
m. and they were looking for work there.
n. And so SHE was our seamstress (...)

The whole segment in (8) is the introduction to a story in which the seamstress Mietje and the fact that she is Belgian play an important role. In Rhetorical Structure Theory, the parenthetical segment (i–m) could thus be accommodated as a *background* satellite, as it provides information necessary for understanding why a Belgian refugee was in the Netherlands. But this analysis would not reflect the parenthetical nature of segment (i–m) (evidenced by the pronominal reference in (n) with the previous reference four clauses back). The reason for this is that the *background* relation in RST does not specify that the satellite can or must be parenthetical. In example (9) below (from Mann & Thompson 1988: 273), the second sentence presents background information

necessary to fully understand the information given in the first sentence, but it is clearly not parenthetical.

(9) Home addresses and telephone numbers of public employees will be protected from public disclosure under a new bill approved by Gov. George Deukmejian.
Assembly Bill 3100 amends the Government Code, which required that the public records of all state and local agencies, containing home addresses and telephone numbers of staff, be open to public inspection.

The situation is even worse for segment (c–e), where the definition of the *background* relation does not apply. This segment is a clear digression from the story, and functions as a comment rather than contributing to the story proper. I do not see a straightforward analysis of this structure in any of the coherence-relation approaches discussed so far.

1.3.2 The need for multiple relations

A crucial limitation of the coherence relation approaches discussed in section 2 is the assumption that the relation between two text segments (if any) can be classified uniquely as exactly one of the set of coherence relations. There are reasons to doubt the validity of this assumption (see for instance, Bateman & Rondhuis 1994, Moore & Pollack 1992, Moore & Paris 1993, Redeker 1991, 1992). Most importantly, there is the evidence from the use of *discourse markers* like *oh, well, now, but, because,* and so forth. Many of them can signal more than one relation, and, crucially, can do so in a single token of use (compare Schiffrin 1987, especially pp. 61f). Consider example (10) (adapted from Schiffrin 1987: 61):

(10) Irene: The standards are different today.
Henry: Standards are different. <u>But</u> I'm tellin' y' if the father is respected an:d eh:
Irene: Henry, lemme ask you a question (...)

But in this example marks not only a semantic contrast, but also signals Henry's disagreement with Irene's position. To account for the multifunctionality of discourse markers, Schiffrin distinguishes five *planes of talk* at which they operate:

> *Information structure* — The upcoming utterance expresses (the result of) a change in the speaker's information state. A typical marker is *oh*.
>
> *Participation structure* — The upcoming utterance constitutes a

shift in the speaker's attitude or stance in the conversation. A typical marker is *now*.

Ideational structure — The upcoming utterance is semantically related to the previous one, typically marked by causal, temporal, or contrastive conjunctions.

Action structure — The upcoming utterance constitutes a step in an action sequence or a reaction to a previous action. Typical markers: *but, then, so.*

Exchange structure — The speaker seizes, retains, or yields the floor. Typical markers: *you know, but, I mean.*

These planes of talk jointly constitute the coherence options in discourse. The model differs from the approaches discussed in section 2 above by allowing multiple relations to hold simultaneously, and by including as sources of coherence interactional relations and the speaker's stance and attitude toward the discourse.[4]

1.3.3 The Parallel-Components Model

The idea of multiple relations is taken one step further in the Parallel-Components Model (Redeker 1990a, 1991, 1992). It is based on the assumption that every utterance is evaluated with respect to (i) the *content* it contributes to the discourse, (ii) its expression of or contribution to a discourse segment *purpose*, and (iii) its *sequential position* in the developing discourse. The first two of these components of coherence correspond to the locutionary and the illocutionary aspects of utterances. The third component reflects the idea, expressed, for instance, by Reichman (1978), Grosz and Sidner (1986), and Polanyi (1988), that discourse is segmented into *context spaces* or *focus spaces* involving attentional shifts as segments are interrupted, closed off, or revisited. In the Parallel-Components Model, these three aspects are assumed to form three parallel structures in discourse, the *ideational* or semantic structure, the *rhetorical* structure, and the *sequential* structure. They correspond roughly to Schiffrin's ideational, action, and exchange structures. Unlike the exchange structure, however, the sequential structure is not limited to modelling interactional movement; turn-change is seen as a special case of a wider class of discourse segmentation phenomena. The three structures can be informally defined as follows:

[4] The *information structure* and the *participation structure*, however, are arguably not concerned with relations between parts of the discourse. They should probably better be considered as motivating the use of certain relations in the other three planes, instead of being planes in their own right (Redeker 1991).

Ideational Structure (propositional meaning conveyed by the discourse) — Two discourse units are ideationally related if their utterance in the given context entails the speaker's commitment to the existence of that relation in the world described by the discourse. Examples: cause, contrast, temporal relations, and so forth.

Rhetorical Structure (hierarchy of intentions in the discourse) — Two discourse units are rhetorically related if the illocutionary force of one unit is subserviant to that of the other. Examples: justification, motivation, evidence, and so forth.

Sequential Structure (coordination and subordination of discourse segments) — The sequential structure describes paratactic or hypotactic relations between adjacent discourse segments that are ideationally and rhetorically only loosely or indirectly related. A paratactic sequential relation is a transition between issues or topics that either follows a preplanned list or is locally occasioned, as for instance in conversation. Hypotactic sequential relations are those leading into or out of, for instance, a commentary, correction, paraphrase, digression, or interruption segment.

Usually one of the three components is more salient than the others for anchoring an utterance in its context. This does not mean that the utterance has no relations in the other two components. In fact, there are good reasons for assuming that multiple relations are not only allowed to co-occur in one token example (as we have seen in example (10) above), but are even *necessarily present*, though often not overtly signalled. Many relations have close associates in the other components. The suggested correspondences between ideational, rhetorical, and sequential relations are summarized in Table 4.[5]

Causal relations, for instance, are often used in discourse as a way of presenting evidence for a claim or argument. When such an explanation or argumentation is lexically or intonationally/typographically marked as an excursus, and thus forms a separate, parenthetical segment in the discourse, the most salient relation is the sequential one. The causal relations *reason, purpose* and *result* and other ideational relations can be the basis for the rhetorical relation of *justification*. A proposal or a request, for instance, can be justified by presenting circumstances, reasons, or purposes, or by describing what would happen otherwise. In descriptive or expository discourse, rhetorical and sequential relations will often go unnoticed, because semantic relations are a priori more directly relevant to the purposes of these kinds of discourse. Still, there remains some sense in which, for instance, the explication of a state of affairs is evidence for

[5] Omitted from the sequential structure in this overview are interruptions, which do not have any obvious associates in the other components, and quotations, which are very flexible in the kinds of ideational and rhetorical functions they can serve (see Clark & Gerrig 1990).

Table 1.4: *Parallelism of Ideational, Rhetorical, and Sequential Structure*

Ideational Relations	Rhetorical Relations	Sequential Relations
Circumstance, Elaboration	Support, Justification	Excursus, Digression
Cause	Evidence	Excursus
Reason, Purpose	Motivation, Justification	Digression
Result	Conclusion, Justification	End of Segment
Solutionhood	Motivation, Acceptance	Response
Condition	Pragmatic conditional	Afterthought, Comment
Otherwise	Support, Justification	Correction, Comment
Interpretation, Evaluation	Justification, Conclusion	Paraphrase, Comment
List, Temporal sequence	List of Arguments	List of discourse segments
Contrast	Concession, Rebuttal	Topic shift, Return

the writer's claim to authority, and the elaboration of some descriptive detail can support or justify the writer's more global characterization.

Vice versa, rhetorical relations always presuppose some extent of semantic relatedness. Adducing a piece of information as evidence, for instance, is only acceptable if it has some kind of causal link with the state of affairs it is supposed to prove true; concession and rebuttal always presuppose an element of semantic contrast; the acceptance of a request or an offer can be seen as solving the interlocutor's problem, need, or wish (implying the ideational relation of *solutionhood*); and so forth.

Contrastive relations are a good example for close parallels between all three structures. In addition to semantic and rhetorical variants, there are sequential contrast relations, often marked with a contrastive conjunction (e.g., English *but, but now, but anyway*, Dutch *maar*; see Redeker 1992, 1994). They arise from topic shifts or speaker returns. The latter can be a speaker's return to an earlier, interrupted segment—what Polanyi and Scha (1983) and Grosz and Sidner (1986) call a 'pop'—or it can be a reaffirmation of a position or argument functioning as a rebuttal against an interlocutor's argumentation (see Schiffrin 1987).

Finally, solutionhood is a notoriously multi-functional relation in discourse analysis. In RST, it is considered a subject matter relation (see Mann & Thompson 1988); Hovy et al. (1992) and Lavid and Maier (1992) classify it as an interpersonal relation; and others (e.g. Jordan 1984) use it to describe a still wider variety of structures. The Parallel-Components Model provides a straightforward account of the functional diversity of this class of relations. Utterances

describing a problem and its solution as facts in the world can be used to motivate the listener or reader to follow an advice, plan, or request. If the problem is presented as a ('rhetorical' or real) question or a request, the utterance presenting the solution can function as an acceptance; in exchanges, this constitutes a response segment.

There is ample a priori evidence, then, for the parallelism between the three components of discourse coherence postulated here. In the next section, I will present two empirical studies that further substantiate my claims. Note that, throughout this section, the names of the relations have been used as intuitive labels only; a classification of the relations within each component, or indeed any commitment to a coherence relation approach as described in section 2, is not essential to the Parallel-Components Model (I will return to this issue in section 5).

1.4 Discourse operators

In the Parallel-Components Model, coherence as the semantic and pragmatic structure of discourse is defined without reference to explicit linguistic signals, that is, cohesion. This clear separation makes cohesion phenomena available as a testing ground for the model. The major empirical prediction of the model derives from its assumption of parallelism of the three postulated components. The model predicts that explicit marking of coherence in one of the components should result in fewer explicit coherence signals being used in the other components. In this section, I will first delimit the intended class of coherence signals (henceforth *discourse operators*), before discussing the major results of two empirical studies in which the model's predictions were tested and confirmed.[6]

Coherence as defined in the Parallel-Components Model hinges on the relevance of an upcoming contribution in the discourse context. It is defined for utterances and longer stretches of discourse and not for elements within utterances.[7] This explicitly excludes coreference as a criterion for coherence (for arguments against equating coherence with coreference see for instance Hobbs 1979, Redeker 1990a). Discourse operators can be defined as follows:

> *Discourse operators* are conjunctions, adverbials, comment clauses, or interjections used with the primary function of bringing to the listener's attention a particular kind of linkage of the upcoming discourse unit with the immediate discourse context.

[6] Throughout this section, I will restrict the discussion to a comparison of ideational versus pragmatic, that is, rhetorical and sequential, uses of discourse operators. In Study 1, there were not enough instances of rhetorical uses to analyze the two pragmatic components separately. Separate analyses of rhetorical and sequential uses of discourse operators in Study 2 are presented in Redeker (1992).

[7] An utterance in this definition is an intonationally and structurally bounded, usually clausal unit, corresponding to Chafe's (1980: 14) 'idea unit' or the basic units defined for *rst* in Mann and Thompson (1988).

This definition excludes from the class of discourse operators anaphoric pronouns and noun phrases, but also any expression whose scope does not exhaust the utterance (focus particles, intra-utterance hesitation and repair signals like *ohh, uh, excuse me*, and so forth). Also excluded are descriptions of discourse structure (*let me tell you a story, as I said before, end of argument*, and so forth), as they are utterances in themselves. They are independent contributions to the discourse, located, like quotations and speech reports, on a separate 'track' of the interaction (see Clark 1996). The Parallel-Components Model treats meta-communicative and quoted utterances as discourse segments in the sequential structure.

The exclusion of anaphora and ellipsis from the class of discourse operators does not mean that these cohesion devices do not signal coherence. They do so by definition. But their primary function is the establishment of referential identity; they do not signal any particular relationship of the upcoming utterance with the immediate context. Similarly, a non-anaphoric definite reference, say, *the wick* can trigger a bridging inference, such as the wick's part-whole relation to an earlier-mentioned candle (Clark 1978); but this link in itself does not tell us how the utterance mentioning the wick is relevant at that point in the discourse. Finally, the alternation between full and reduced reference forms in discourse is often used to signal segment boundaries and continuation (see, e.g., Fox 1987; Grosz, Joshi & Weinstein 1995; Vonk, Hustinx & Simons 1992); but these signals, too, are tacit about the kind of boundary involved or the type of linkage required to achieve the appropriate contextual interpretation of the utterance. This is what distinguishes all those primarily referential devices from discourse operators, whose main function is to signal a *particular* linkage of an utterance to its context.

Note that my definition does not identify the lexical items themselves as discourse operators, but rather applies to particular uses of such items. It thus excludes from the class of discourse operators any deictic uses of indexicals such as *now, here, today* and so forth, without thereby introducing the need to postulate separate lexical entries for anaphoric (and thus potential discourse operator) uses of those words. This focus on use is also desirable from a diachronic point of view, since lexical items such as interjections can acquire, lose, or change their potential to function as discourse operators as the language develops (Bolinger 1989).

1.4.1 Discourse operators in spoken narrative discourse

The Parallel-Components Model stipulates that the semantic, rhetorical and sequential structures in discourse form three interdependent components of coherence. The use of discourse operators to explicitly signal coherence links depends on the semantic and pragmatic complexity of the discourse: A description can have a simple unmarked list structure, whereas the semantic and pragmatic links in expository or hortatory discourse usually require marking

of causal or rhetorical relationships; written narratives contain mainly temporal and causal links, whereas story-telling in conversation is rich with speaker comments, necessitating rhetorical and sequential linkage. Speakers, in their effort to signal the relevance of a contribution in the current context, aim for an optimal balance between the need for explicit grounding and linking, and the desire to be efficient and to make implicit use of existing common ground (cf. Grice 1975, Clark 1996). Therefore, if a contribution has salient coherence links in more than one of the coherence components, speakers will preferentially single out one of these components for (the most) explicit signalling, leaving the other(s) for the listener to infer. The Parallel-Components Model thus predicts a trade-off in the use of semantic, rhetorical and sequential discourse operators.

This prediction was confirmed in a study of film descriptions where the relative salience of semantic and pragmatic links was varied by having speakers talk to a friend or to a stranger. American speakers who were describing a film to a friend used more markers of pragmatic relations than speakers who had only just met their listener; the opposite difference was found for markers of ideational structure (for details of the film description experiment and the analyses see Redeker 1986, 1990a). Example (11) illustrates the speaker's choice between marking a pragmatic and/or a semantic relation in those film descriptions:

(11) a. *real example: rhetorical relation*
(...) and uhm she apparently named a very low price - for the rent, and - because he said, oh that's far too little.
b. *constructed variant: rhetorical and sequential relation marked*
(...) and uhm she apparently named a very low price - for the rent, you know, because he said, oh that's far too little.
c. *constructed variant: semantic relation*
(...) and uhm she apparently named a very low price - for the rent, so he said, oh that's far too little.

The results of the film description experiment fully confirmed the model's predictions. In fact, the complementarity of semantic and pragmatic operators use was almost too perfect. The number of pragmatic operators varied between nine and twenty per hundred clauses in the various conditions, but the total number of operators was almost constant (48 to 51 per hundred clauses). This raises the serious possibility that the trade-off between the two kinds of discourse operators in this study might have been caused by a linguistic constraint or a processing limitation. Using many operators of one kind might have filled all available (usually utterance-initial) slots or exhausted the speakers on-line resources, thus causing the proportionate reduction in the complementary kind of operators. To investigate this possibility, a second study was conducted.

1.4.2 Discourse operators in newspaper articles and columns

This study was designed to replicate the trade-off found in the film description study, while excluding the alternative interpretations of that result.[8] The on-line processing constraint was easy enough to avoid by investigating deliberate writing, that is, edited written texts, instead of spontaneous talk. Excluding the linguistic constraint hypothesis was more complicated. The complementarity hypothesis does not claim that language won't allow us to mark more (or less) than about 50% of our clauses with operators; our everyday experience obviously disproves such a statement. What can reasonably enough be claimed is that a particular discourse genre may require a certain conventionally determined register with a relatively fixed overall density of operators. Inasmuch as genres are defined in terms of certain rather stable contents and communicative tasks, the Parallel-Components Model predicts just such constancy. In order to distinguish the two explanations, then, we need to find a stylistically homogeneous genre with subgenres that allow for gradual variation in contents and goals.

With these criteria in mind, 23 articles and editorial columns of the Dutch weekly *Vrij Nederland* were collected, representing a range of different contents and text functions. Idiosyncratic variation due to individual stylistic preferences was controlled by sampling from the writings of a single author, the editor-in-chief, who writes witty contributions for the magazine's 'junior' pages, a satirical column, commentary, book reviews, and feature-articles. Example (12) is a fragment from the satirical column *Het rijke leven van Douwe Trant*, written as the diary of a very conservative post office clerk. Discourse operators are underlined and marked with (i) for ideational, (r) for rhetorical, and (q) for sequential relations.[9]

(12) Now (q) how can you make such a comparison? [*as colleague Dijkstra did between Gorbachev and Premier Lubbers – GR*]
First of all (r) we are in an alliance with the Americans,
so (r) it's out of place anyway (r) to (i) make such a comparison.

[8] For a detailed report see Redeker (1992).

[9] Original Dutch text (from *Vrij Nederland* of May 2, 1987):
Hoe kan je nou (q) zo'n vergelijking maken? Allereerst (r) zit je in een bondgenootschap met de Amerikanen, dus (r) het is al (r) ongepast om (i) zo'n vergelijking te maken. En ten tweede (r) blijft die Gorbatjov een communist, dus (r) die maakt wel mooie praatjes, maar (r) die zit ondertussen (i) de hele dag microfoontjes in the Amerikaanse ambassade in te bouwen. Dus (q) het lijkt nergens op.
Maar (q) het ligt voor de hand om (i) te denken zoals (i) Dijkstra dat doet: De Russische leider heeft de wereld verbaasd doen staan met een grote rede, en nu (i) komt ook (i) onze leider met een toespraak, die (i) zeer, zeer opmerkelijk is. Wat (i) dat betreft is het wel (r) identiek. Maar (r) iedereen weet, dat (i) de Rus het juist gedaan heeft, omdat (i) het daar in dat land economisch zo'n grote puinhoop is. Terwijl (r) het bij Lubbers juist is, omdat (i) hij Nederland er economisch bovenop geholpen heeft en nu (i) aan de moraal kan beginnen.

And secondly (r) this Gorbachev is still a communist,
so (r) he may be making nice speeches,
but (r) in the meantime (i) he is installing
microphones in the American embassy all the time.
So (q) it amounts to nothing.

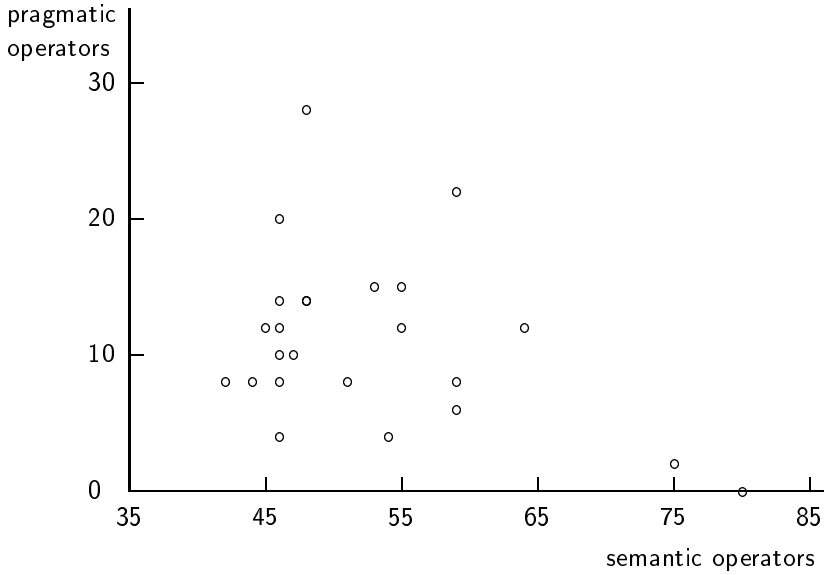
But (q) it does make sense to (i) think as (i) Dijkstra does:
The Russian leader has surprised the world with a great speech,
and now (i) our leader also (i) presents us with a speech
that (i) is very very remarkable.
As fas as (i) that is concerned, it is indeed (r) identical.
But (r) everyone knows that (i) the Russian did it
because (i) the economy is such a big mess there in that country;
whereas (r) for Lubbers
it's because (i) he has straightened out the Netherlands economically
and can now (i) get started on moral issues.

All connective expressions were coded as semantic, rhetorical, or sequential discourse operators.[10] To eliminate differences due to text length, the counts of the discourse markers were converted to indices per 100 clause-sized units. The distribution of these indices for ideational and pragmatic markers is shown in Figure 1.

Given the variation in the texts' communicative functions, the model does not predict a negative correlation between semantic and pragmatic discourse operators in this sample. But the text-functional variation can be controlled statistically using partial correlations, if appropriate indicators of the texts' communicative complexity (with respect to contents and goals) are available. The partial correlation then controls the texts' underlying semantic and pragmatic complexity by pulling out that part of the variation in coherence marking that can be explained through variations in contents and goals. The residual variation in the use of semantic and pragmatic operators can then be thought of as the extent to which the—then constant—underlying structures are made explicit in each of the components. For these residuals, the model predicts a trade-off, that is, strong negative correlations, between semantic, rhetorical, and sequential discourse operators.

[10] The coding rules for the identification and classification of discourse markers were developed in many cycles of alternations between text-internal coding and across-texts consistency checking. Coding each instance in its full context of occurrence secures contextual adequacy of the function assignment and substantially reduces the number of ambiguous cases, while the paradigmatic control of considering the de facto extension of each coding category in the corpus helps to detect inconsistencies and optimize the homogeneity and separability of the coding categories. When the rules had been finalized, two trained assistants provided independent codings of 40% of the material. Their classifications agreed with mine in 673 of the 748 cases (= 90%). All disagreements could be resolved in discussion.

Figure 1.1: *Semantic and pragmatic discourse operators (per 100 clauses)*



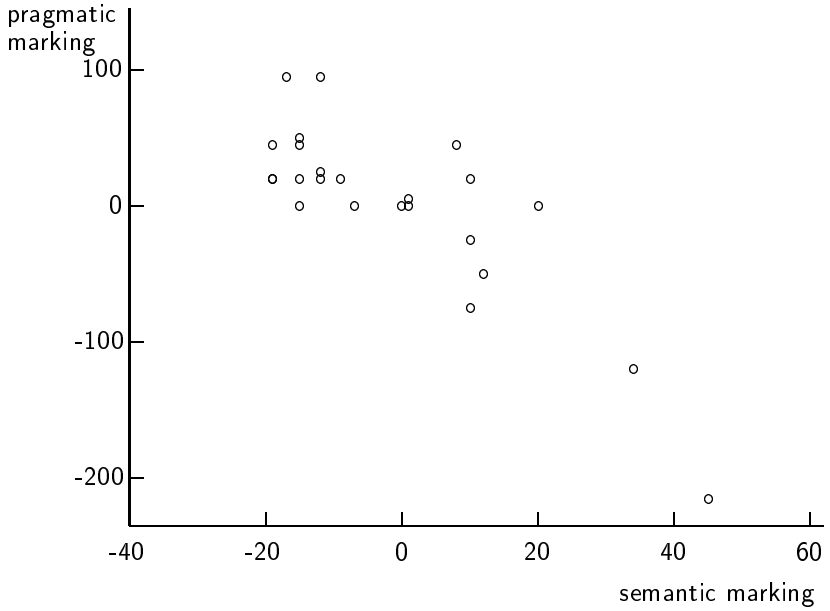
Readers' judgments were collected using a set of four bipolar rating scales. The readers had to indicate to what extent they felt the writer was *informing* versus *arguing, informing* versus *entertaining, describing* versus *explaining*, and how *simple* versus *complex* they found the subject matter of the text. Each text was judged by three readers, and the averages of their scores were used in the analyses.

As an additional, more direct, assessment of the underlying semantic and pragmatic complexity, I determined for each clause-sized unit whether it had a non-trivial ideational, rhetorical, or sequential link to its immediately preceding context.[11] The agreement of two independent coders, tested for 17% of the text material, was 92%. The counts were converted to indices per 100 units, yielding three variables as measures of the semantic, rhetorical, and sequential (presentational) complexity of each text.

The first factor from a principal components analysis of the four ratings and the three structure variables was used as a predictor of marker density. It accounted for 7% of the variation in the use of semantic operators ($r = .26$), and 42% of the variation in the use of pragmatic operators ($r = .65$). When this predictable variation is extracted from the marker-density variables, the residuals covary as shown in Figure 2. All data points lie close to the diagonal

[11] Non-trivial links are those that could have been signalled by a discourse marker (regardless whether such a marker was in fact used in the instance at hand). Simple additive relations that were or could have been marked with Dutch *en* (*and*) were considered 'trivial'.

Figure 1.2: *Residual covariation of semantic and pragmatic marking after controlling for underlying text structure and function*



now, as the complementarity hypothesis predicted. The negative correlation is highly significant ($r = -.84$, p = .001).[12]

We can conclude, then, that the lexical marking of ideational and pragmatic relations is indeed to a considerable extent complementary: the more explicitly speakers or writers signal the relations in one structure, the less explicit—all other things being equal—they need be with respect to the other components.

1.5 Conclusions

Textual coherence and conversational coherence are not as incommensurable as much of the traditional research on those discourse types might suggest. On the basis of current developments in discourse theory and extensive analyses of monologic and interactive discourse, I have developed a model that accommodates monologic and dialogic structures in a single framework (although a lot of work still needs to be done in order to provide a satisfactory account of, for instance, sequential relations in dialogue). It allows predictions about the use

[12] The ratings and the structure variables contributed about equally to this result. When only the variation predictable from the ratings was extracted, the correlation was –.71, using only the structure variables yielded $r = -.66$; both are still highly significant.

of discourse operators. The predicted complementarity in the lexical marking of ideational and pragmatic links has been shown to hold in spoken narrative and in newspaper discourse.

The Parallel-Components Model is compatible with coherence-relation approaches inasfar as they can be understood as describing discourse structures in terms of the most salient relations between adjacent segments. The conflation of the three components into one structure raises the question of compatibility or isomorphism. Moore and Pollack (1992: 543), for instance, claim that what they call the intentional and informational structures, in some discourses "cannot be produced simultaneously by the application of multiple-relation definitions that assign two labels to consecutive discourse segments." The example they use to illustrate and support this claim is the following constructed fragment:

(13) (a) Come home by 5:00. (b) Then we can go to the hardware store before it closes. (c) That way we can finish the bookshelves tonight.

The 'intentional level' analysis Moore and Pollack give, quite plausibly assigns nuclear status (see section 2.1) to utterance (a): "... finishing the bookshelves (c) motivates going to the hardware store (b), and [...] (b) and (c) together motivate coming home by 5:00 (a)" (p. 542).

Where I strongly disagree with Moore and Pollack is their analysis of the ideational (or, in their terms, informational) structure of this example. They claim that "coming home by 5:00 (a) is a condition on going to the hardware store (b), and together these are a condition on finishing the bookshelves (c)" (p. 543), placing (c) in nuclear position. Although these postulated relations might well be reasonable inferences from a knowledge base containing those bits of information, the analysis is not a description of what the speaker of (13) is saying. His main concern is obviously to get the listener to come home in time, and he does not formulate (a) and (b) as conditions.

My own RST analysis of this example makes (b+c) a justification for the request in (a), with (c) further justifying the proposal to go to the hardware store (b). Those *justify* relations are licensed by the existence of semantic *volitional result* relations between the proposed activities, which yield the same nuclearity assignments as the pragmatic relations. From the perspective of segmentability (not considered by Moore and Pollack), the structure would still be the same: If the speaker had inserted, for instance, a *you know* between (a) and (b) or between (b) and (c), she would in both cases have marked the subsequent contribution (respectively, (b+c) or (c)) as a supporting parenthetical segment.

At least with respect to this example, then, I see no reason to abandon the assumption that the ideational, rhetorical, and sequential structures are in principle isomorphic and can for descriptive purposes be conflated into one hierarchical structure of the discourse at hand.

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