

Toward a Theory of Reading Between the Lines: an exploration in discourse structure and implicit communication.

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1. Abstract

It is widely recognized that some portion of communication using language is generally implicit rather than explicit. Many different varieties of implicit communication phenomena have been identified, and a diversity of explanations for various varieties has been proposed. Finding a unity among the phenomena or the explanations is currently premature. The search for a unified account can be advanced by attempting to identify the full range of phenomena.

This paper explores the relationship between implicit communication and a particular variety of discourse structure, the structural correlates of the coherence of texts.

Previous linguistic study has identified what a number of researchers call “coherence relations,” and their linguistic signals, as important sources of coherence in texts. Particular coherence relations, such as causal or concessive relations, have been identified with particular implicit communication that accompanies them. Study of coherence relations has often focused on particular signals of their presence, such as conjunctions.

Here we are seeking to take a coordinated approach to all coherence relations, while at the same time linking the phenomenon of coherence relations to implicit communication. The paper takes steps toward such an account, but the account provided is not complete.

Rhetorical Structure Theory (RST) is an approach to describing the structure of texts. It has been found applicable to a wide variety of text types within the general scope of carefully prepared written monologues. For communicative, coherent texts, RST analysis assigns a role to every part. Roles are assigned in a way that links every part into a larger aggregated part, eventually linking the whole text into one aggregate. The pattern of links is a kind of discourse structure.

Most of the links correspond to coherence relations, which may or may not be signaled explicitly in a text. When an RST analysis links up every element of a text, it can be seen as the basis for an account of the coherence of that text.

Each use of a coherence relation carries with it one or more implicitly communicated

propositions, called “relational propositions” or RPs.

The issue for this paper is: How can these implicitly communicated propositions be identified?

Given simply an analysis diagram, which contains the text, the pattern of related spans and just the names of the relations, it is quite obscure what relational propositions would be asserted by particular relations in the text; relation names are simply too vague. However, in RST each relation has not only a name but a definition. Creating an RST analysis is equivalent to affirming that the definition of each link in the diagram of the analysis is satisfied. The relational propositions can be derived from these definitions.

The paper explores a simple model of how relational propositions can be identified. The model is discussed in terms of the kinds of information which it must be responsive to and the results that it produces. The model is designed to be applicable whether the relation which gives rise to the RP is signaled or not. It is thus distinct from a model of the interpretation of connectives. Beyond prior work, the paper demonstrates in detail that a systematic approach to identifying implicit communication from discourse structure can be found, applicable even to unsignalled cases. The model is presented in terms of examples of natural text.

The paper also surveys a broad list of other phenomena of implicit communication, in order to establish that RP is not a new name for a previously understood phenomenon. The phenomena examined include anaphoric presupposition, conventional and conversational implicature, deixis, euphemism, invited inference, indirect speech acts, intertextuality, irony, metaphor, presupposition, pronominal reference, simile and zero anaphora.

2. Implicit Communication

The idea of implicit communication, that some of what a text communicates is not symbolized explicitly, has a long and honorable history (Grimes 1975; Halliday 1976). Even so, there is no consensus on a comprehensive account of implicit communication, and the list of varieties of implicit communication is still open and growing.

The area of discourse structure is particularly open. It is to be expected on general principles that discourse structure communicates something, and that what it communicates is not restricted to being explicit.

Coherence relations have been recognized for a long time as a kind of discourse structure (Traugott 1997) and studies of their expression are numerous (Redeker 1990; Noordman, Vonk et al. 1992; Sanders, Spooren et al. 1992; Sanders, Spooren et al. 1993; Knott and Dale 1994; Schiffrin 1994; Goutsos 1996; Moser and Moore 1996; Bateman and Rondhuis 1997; Sanders 1997; Spooren 1997; Spooren and Risselada 1997; Callow 1998; Knott and Sanders 1998; Lenk 1998; Risselada and Spooren 1998). There are open questions about what sorts of communication arise from coherence relations, about what particular relations there are, about what each relation communicates, and about how relations are identified on the basis of linguistic expressions.

All coherence relations, in every occasion of use, make a particular kind of assertions, which we are calling Relational Propositions (RPs). The pervasiveness of relational propositions is not widely recognized. This paper seeks to develop the idea of RPs, in particular giving a way of identifying them. This approach to identification, along with the notion of the distinctiveness of RPs, is the key contribution of this paper.

RPs will be shown to have the following attributes:

- Each RP arises from discourse structure.
- RPs are often unsignalled.
- Creation of RPs requires 2 or more clauses.
- RPs sometimes involve large structured collections of clauses.

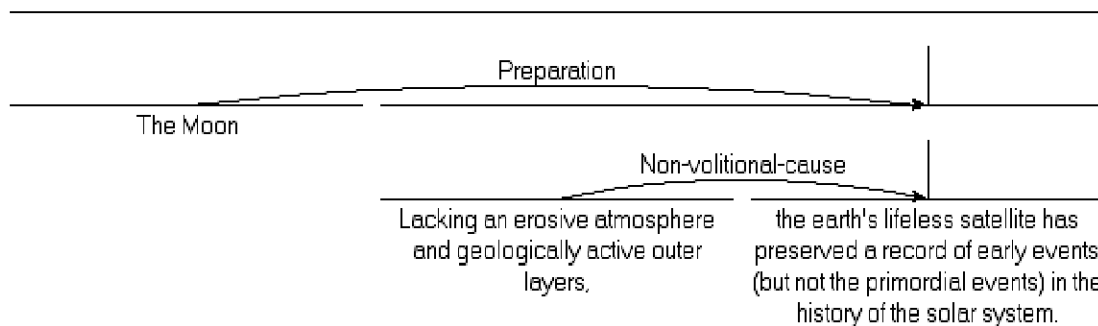
3. Rhetorical Structure Theory

Rhetorical Structure Theory (RST) can be seen as a particularly elaborate development of coherence relations (Mann and Thompson 1988), focused on written monologue texts. Along with the relations, RST presents discourse structures of which they are a part. It includes methods for identifying relations in text and some prior discussion of RPs (Mann and Thompson 1983; Mann and Thompson 1985; Mann and Thompson 1986; Thompson and Mann 1986; Mann and Thompson 1992). One of the distinctives of RST is that it deals with the coherence relations directly rather than corresponding linguistic expressions.

Below is an example of RST analysis of a particularly simple text, an abstract which appeared in *Scientific American Magazine*.¹

The Moon

Lacking an erosive atmosphere and geologically active outer layers, the earth's lifeless satellite has preserved a record of early events (but not the primordial events) in the history of the solar system.



It is generally accepted that this abstract is coherent, and that it expresses something about cause (in this case, the cause of the moon preserving a record of early events) by using a causal coherence relation. (For this first example we will focus only on the causal relation.) Also, for this case but not in general, the causal relation is not signalled explicitly. In RST terms this coherence relation is called Non-Volitional-Cause, and the text asserts one or more relational propositions about this particular kind of cause.

RPs have been recognized as vital to creating the impression of text coherence. (See,

¹ The Moon, by John A. Wood, in *Scientific American*, September 1975, p. 92.

e.g., (Mann and Thompson 1988).)

The central problem for this paper is: How are RPs identified? The key issues have to do with sources of information and substance for the RPs, not their precise formalization. Our presentation is informal, and we expect that it could be formalized in a variety of ways, depending on the demands of the particular framework chosen for the formalization. For frameworks that lack propositions, we expect a slightly different but corresponding representation.

As noted above, given a text, with its discourse structure in RST terms and the names of the relations in the structure, there is not enough information to identify the relational propositions for those relations. This is because, perhaps inevitably, the names of the relations are not precise enough. They are polysemous terms from common language, unsuited for this use.

However, RST provides a definition for each relation that it uses. Adding the relation definitions to the other information provides an adequate basis of information for deriving RPs.

The principal use of definitions in RST is to make the interpretation of RST analyses definite. An analysis, generally represented by an RST diagram, is really an assertion by the analyst that at each particular point in the text, the definitions represented by the structures in the diagram apply to the text being analyzed. RST permits the analyst to accept multiple analyses of single texts. This can be used to express the finding that multiple relations and structures hold between parts of a text. It also can be used to describe structural ambiguities of texts. Most often, analysts find single (unambiguous) RST analyses, so we will focus on that case here.

The comments below are a sketch of a method for identifying RPs. It is intended to be representative and suggestive rather than comprehensive. We first examine the RST relation definition for Non-Volitional-Cause, the relation used in the Moon example, then state the RP for the example, and finally indicate how the RP is derivable from the text, the analysis and the definition.

The intervals of text that are related by RST relations are called spans. A span may be something simple, such as an independent clause, or it may itself have discourse structure and include more than one smaller span. Most RST relations hold between a satellite and a nucleus, the nucleus being the one of the two which is judged by the analyst to be more central to the author's purpose. (So, for the Moon example, saying that the moon has preserved a record is judged to be more central to the author's purpose than saying that the moon lacks an atmosphere.)

As illustrated below, each RST relation is defined in terms of a set of constraints.

The Moon text diagram above names the relation between the satellite and the nucleus as Non-Volitional-Cause. It is defined as follows:

Definition of the Non-Volitional-Cause Relation

Constraint on Nucleus: Nucleus is not a volitional action

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Constraints on Satellite: none

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Constraints on the Nucleus-Satellite Combination:

- 1) Satellite, by means other than motivating a volitional action, caused Nucleus.
 - 2) Without the presentation of Satellite, Reader might not know the particular cause of the situation expressed in Nucleus.
 - 3) A presentation of Nucleus is more central than a presentation of Satellite to Writer's purposes in putting forth the Nucleus-Satellite combination.
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Writer intends this Effect:

Reader recognizes Satellite as a cause of Nucleus

Informally, for the Moon text, the causal relation is asserting that the lack of an erosive atmosphere and geologically active layers has caused the moon to preserve a record of early events (but not the primordial events) in the history of the solar system. The general pattern of the relational proposition is that the satellite expresses a cause of what the nucleus expresses.

4. Finding Relational Propositions

How can the proposition above be found? What method has some generality in deriving the proposition?

First of all, we must note that the method described here is simply identifying the result, and showing that propositions are identifiable. It is not offered as a possible component of a model of text reception, and no cognitive claims should be associated with it. On the contrary, although the method presumes that the relation has been preidentified, we expect that in general identification of relations, recognition of discourse structure, estimation of authors' purposes and identification of relational propositions are inseparable parts of a single process, more complex than this sketch suggests.

In the definition, various parts are included in order to distinguish this relation from others (e.g. the volitional ones.) Other parts are included to distinguish nucleus from satellite or to assure the plausibility of the writer's using this relation. Such parts can be preidentified in the definitions, and they do not contribute to the RP.

The part that is essential in this case is the final section, called the *effect field*, which says that the writer intends that the reader recognizes the satellite (content) as a cause of the

nucleus (content.) Since the components of this intention are identifiable from the text (as is established by the process of analysis,) we can use them to derive the RP. It is simply a move from {writer intends that reader recognize that P} over to {writer asserts P.} So, using this transfer, identifying the nucleus and satellite from the analysis and inserting the details of nucleus and satellite that come from the text, we can derive the RP, namely that the lack of an erosive atmosphere and geologically active layers has caused the moon to preserve a record of early events (but not the primordial events) in the history of the solar system.

So, we have shown an example of identifying an RP.

All relations create assertions of RPs. The assertion above is implicit, and so it is necessary to understand what variety of assertion this is. Is it on a par with the assertion that the moon has preserved a certain kind of record? Many approaches to the logic of the use of language make a distinction between defeasible assertions, which further use of language could possibly deny, and direct assertions, for which going on to deny the assertion would produce a contradiction. In this case, the RP is asserted defeasibly, while the assertion about preserving a record is asserted directly.

In general, unsignalled relations create defeasible assertions. Uniquely signaled relations create direct or non-defeasible assertions.

Some cases, especially those where there is some explicit indication of the identity of the coherence relation, produce direct assertions of RPs. For instance, if a variant of this text included some explicit expression of cause, the RP might be directly asserted. For example, if *and because of this* or *so* were inserted at the beginning of the final unit, the RP might not be defeasible.

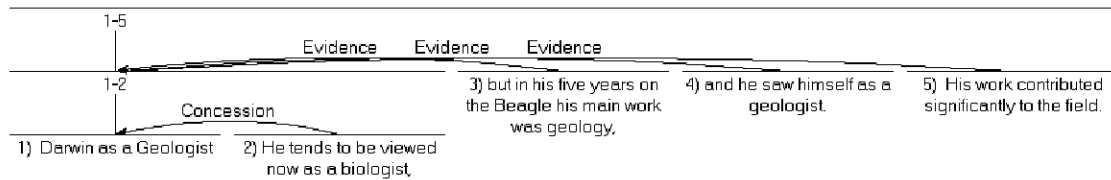
There are middle cases, in which signaling does not identify a relation explicitly, but rather constrains the possible choices. Many uses of *but* would be examples. These need further study, but they subjectively resemble the defeasible cases.

Now we move to showing complex cases, using further examples of RST analyses and the corresponding RPs. The first is an abstract from a *Scientific American* article about Darwin²

² Darwin as a Geologist, by Sandra Herbert, *Scientific American*, May 1986, page 116. Unit numbers added.

1) Darwin as a Geologist

2) He tends to be viewed now as a biologist, 3) but in his five years on the Beagle his main work was geology, 4) and he saw himself as a geologist. 5) His work contributed significantly to the field.



Here is a portion of the definition of Concession, focusing on supporting the discussion below:

Definition of the Concession Relation

Constraint on Nucleus: Writer believes Nucleus.

Constraints on Satellite: Writer is not claiming that Satellite does not hold.

Constraints on the Nucleus-Satellite Combination:

- 1) Writer acknowledges a potential or apparent incompatibility between Nucleus and Satellite.
- 2) Recognizing the compatibility between Nucleus and Satellite increases Reader's belief of Nucleus.

Writer intends this Effect: Reader's belief of Nucleus is increased.

The Concession relation in RST functions as follows: It asserts that in the writer's view two particular ideas are compatible. One is an idea being advanced by the writer. The other is an idea which the writer suspects the reader may regard as incompatible, and further, the reader may believe it to a degree such that it potentially reduces the plausibility (reader's belief) of the writer's principal idea. By conceding the other idea, and by holding both at once, the writer prevents reduction of plausibility of the principal idea. (Implicitly, the writer is relying on the reader to use a principle of individual consistency, in particular to

regard the writer's expressed thoughts as locally consistent.) Thus the key assertion is one of compatibility, or in other words, of not being inconsistent.

For the Concession relation in the Darwin text, one of the assertions is: [Darwin tends to be viewed now as a biologist] is not inconsistent with [Darwin as a Geologist]. The general pattern is: [[satellite] is not inconsistent with [nucleus]].

The fact that the writer used *but* to signal Concession is evidence that some one of a set of relations, including Concession, is being expressed. Note that the definition of Concession does not refer to any lexical item and so is not lexically linked to English.

From the other relations there are at least three other RPs asserted by the relational structure, namely that each of three conditions stands as evidence of [Darwin as a Geologist].³ One RP would assert that Darwin's seeing himself as a geologist is evidence of [Darwin as a Geologist.] A second would assert that Darwin's principal work on the Beagle being geology is evidence of [Darwin as a Geologist.] Finally, it is also asserted that Darwin's contributing significantly to geology is evidence of [Darwin as a Geologist.]

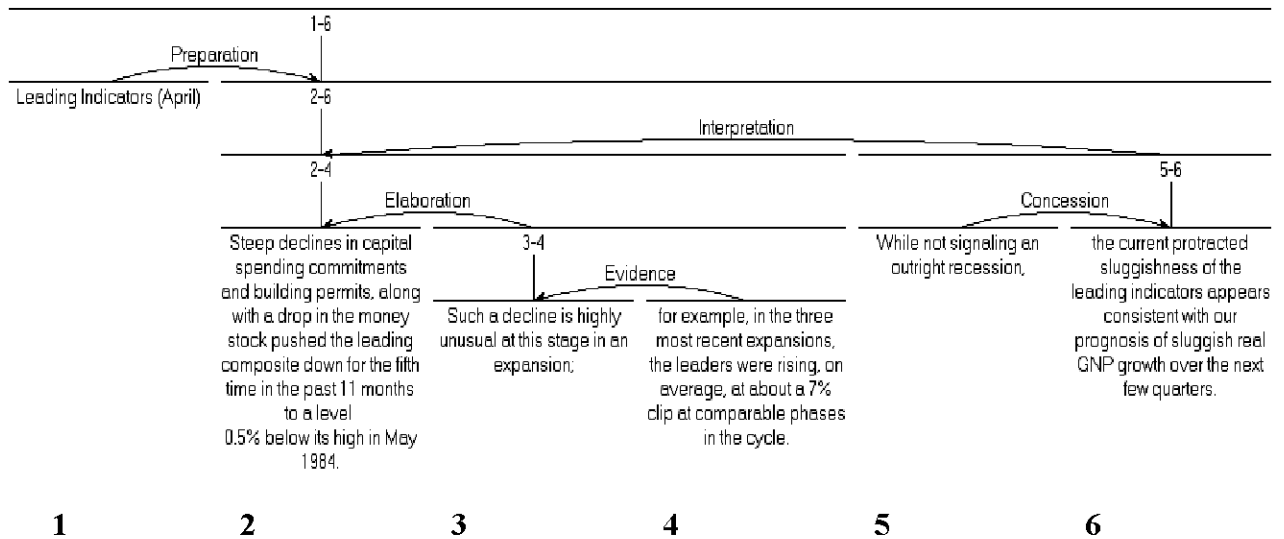
The Darwin example shows RPs for a wider variety of relations, and diversity of outcome for a single relation, as well as identifying an unresolved issue about the nature of the parts of RPs that arise from the text rather than the relations.

Here is a third text, from a large government financial statistics report.⁴ The parts have been numbered by the analyst:

- 1) Leading Indicators (April)
- 2) Steep declines in capital spending commitments and building permits, along with a drop in the money stock pushed the leading composite down for the fifth time in the past 11 months to a level 0.5% below its high in May 1984.
- 3) Such a decline is highly unusual at this stage in an expansion;
- 4) for example, in the three most recent expansions, the leaders were rising, on average, at about a 7% clip at comparable phases in the cycle.
- 5) While not signaling an outright recession,
- 6) the current protracted sluggishness of the leading indicators appears consistent with our prognosis of sluggish real GNP growth over the next few quarters.

³ This example points up an unresolved problem. The title of the article evokes an image of Darwin, functioning as a geologist. This image is sufficient to identify the subject matter of the article and make the abstract meaningful. But it does not seem propositional. There is no verb in it. Should it be regarded as the same as "Darwin worked as a geologist" or "Darwin saw himself as a geologist" or even "I, writing this article, see Darwin as a geologist." The text does not say, and apparently it does not need to say.

⁴ U. S. Federal Reserve Board, May 1985.



Based on the definitions of Evidence, Elaboration, Concession, Interpretation and Preparation respectively, the Relational Propositions for this text are (more briefly):

4 -3: (4) IS EVIDENCE FOR (3)

2 - 3,4: (3 and 4) PROVIDE ADDITIONAL DETAIL FOR (2)

5 - 6: (5) IS NOT INCONSISTENT WITH (6)

5,6 - 2,3,4 (5 and 6) ARE AN INTERPRETATION OF (2,3,4)

1 - 2,3,4,5,6 (1) PREPARES THE READER TO MORE EASILY UNDERSTAND (2,3,4,5,6).

where the information expressed by each unit is indicated by its number. This is a shorthand, but it also conceals some complexities. For example, we note that the next to last one, on interpretation, makes an assertion about a relationship which is (in a sense) between three clauses and two others. When fully spelled out, this would be a relatively complex assertion, and in various formalizations there would be alternatives of detail. Since many of these complexities cannot be addressed in a framework-neutral way, they are not addressed here.

The examples have illustrated derivation of a few RPs from analyses, and exposed the underspecified state of the process. They illustrate the essential role of statements about the reader's knowledge, beliefs, reasoning, social tendencies and judgment. Of the diverse set of more than 25 relations currently defined in the most widely known version of RST, only 6 have been touched upon. Even so, the examples establish the notion that discourse structure is a source of assertions. We hope that these are enough to make the notion of RPs clear and credible.

In this set of examples, we can identify about five places where the identity of the relation is signalled or constrained explicitly, out of a total of eleven, (even counting title formatting, and "for example" to represent evidence.) In wider samples the proportion is

usually under 50%, the measure depending on the method of counting. The occurrence of so much unsignalled communication, and its tight link with coherence, raise questions about how readers or hearers identify the unsignalled relations that are creating the coherence of texts. It raises issues of what kinds of semantics can account for this unsignalled communication, and what kinds of text understanding processes can identify the relations of a text and their RPs.

Our account of RPs is seriously incomplete, which suggests needs for additional research. For one thing, all of the examples above have exhibited only a single RP arising from use of a coherence relation. However, very commonly more than one RP results from a particular use of a relation, because the relation definition enforces more than one condition in its constraints. Where the definition presents alternatives, the assertions may likewise present alternatives. Further alternatives can arise from ambiguity of discourse structure. Many of the assertions will be complex because they involve plausible assessments by the writer of some characteristic of the expected readers.

The account is also incomplete concerning details of how the assertions contribute to the text as a whole -- how, for example, they interact with other textual phenomena such as quotation, indirectness, exaggeration or negation.

So, it is clear that additional research on RPs is needed.

5. Other Implicit Communication Phenomena

It is worthwhile to establish that RPs are a distinct kind of implicit communication resource, different from previously identified resources. Here we examine whether the assertion of RPs is simply a new name for some better known mode of implicit communication. Preparing to do this, we list a set of implicit communication resources. In order to establish RPs as distinct from some other resource, we only need to find cases that create implicit communication by the other resource, but not by RPs. Notice that the distinctness of RPs is independent of whether another resource seeks to account in a different way for comparable phenomena.

Many very different phenomena of implicit communication have been identified (Sperber and Wilson 1995; Fauconnier 1997; Carston and Uchida 1998; Turner 1999). They include anaphoric presupposition, conventional implicature, conversational implicature, deictic pronouns, euphemism, invited inference, indirect speech acts, intertextuality, irony, metaphor, presupposition, pronominal reference, simile and zero anaphora. Because of the diversity of phenomena, we need several criteria to establish the distinctness of RPs.

First we note that for many of these, they can be exhibited using single clauses, whereas RPs cannot be exhibited using single clauses. Examples are deictic pronouns (That's an aardvark), euphemism (Where is the rest room?), indirect speech acts (Can you pass the salt?), irony (My little brother is the smartest person in the world), metaphor (He's a fire engine), presupposition (The King of France is bald), pronominal reference and simile (He's like a fire engine). Additional resources require anaphora or some semantic dependency, which RPs do not require. Examples are anaphoric presupposition.⁵ and zero

⁵ An example of anaphoric presupposition from (Webber, Knott et al. 1999) is "On the one hand, John loves

anaphora (Goes there every day). Conventional implicature (for example “He’s an Englishman. Therefore he is brave.”) requires existence of a verbal convention, and conversational implicature, along with invited inference, (Yesterday I broke a finger) is defined as a phenomenon of conversational interpretation rather than monologue. (The implicature examples and terminology are from a manuscript of (Grice 1975).) Finally, intertextuality requires multiple texts, which RPs do not require.

Clearly RPs are distinct from these other resources.

6. Conclusions

This paper has shown that it is possible to partially specify a way to identify implicit assertions that arise from discourse structure. In doing so, we have also clarified the relationship between coherence and implicit communication. The method suggests that a general approach, not confined to particular lexical items or individual relations, may be found.⁶

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Barolo. So he ordered three cases of the ‘97. On the other hand, because he’s broke, he *then* had do cancel the order.” (The focus is on the dependency of *then*.) This comes from a very interesting work developing an account of discourse relational semantics. The account is more explanatory and less descriptive than RST.

⁶ There is an RST website, including a path to an email discussion group on RST, with discussion archives, at: <http://www.sil.org/linguistics/RST>. The site contains many additional analyses, bibliographies and an introduction to RST.

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