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Rhetorical Structure Theory and Text Analysis

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Recent research on text generation has shown that there is a need for stronger linguistic thoeries that tell in detail how texts communicate. The prevailing theories are very difficult to compare, and it is also very difficult to see how they might be combined into stronger theories. To make comparison and combination a bit more approachable, we (Mann and Thompson) have created a book which is designed to encourage comparison.

A dozen different authors or teams, all experienced in discourse research, are given exactly the same text to analyze. The text is an appeal for money by a lobbying organization in Washington, D.C. It informs, stimulates and manipulates the reader in a fascinating way. The joint analysis is far more insightful than any one team's analysis alone. This paper is our contribution to the book.

Rhetorical Structure Theory (RST), the focus of this paper, is a way to account for the functional potential of text, its capacity to achieve the purposes of speakers and produce effects in hearers. It also shows a way to distinguish coherent texts from incoherent ones, and identifies consequences of text structure.

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1 Aims of Discourse Analysis

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from Advanced Learner's Dictionary (Hornby et al):

language n. 1. human and non-instinctive method of communicating ideas, feelings, and desires by means of a system of sound symbols. **2.** ...

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The key distinguishing attribute in defining "language" is that it is a method of communicating. When people get together and interact, especially in frequently recurring kinds of encounters, our usual experience is that the interaction is purposeful for one or more participants. They can achieve particular ends by using language. If speaker and hearer are using a shared language then frequently they can achieve their purposes, but if they do not have a shared language then they fail. Communication is effective if it creates the potential for a successful outcome, achievement of the participants' purposes. Invitations to social events, negotiations to buy things and requests for gifts of money are a few of these kinds of encounters.

All this would be tediously obvious, except that this capacity of languages to enable success in such interactions has not been accounted for by linguistics. In our research in discourse analysis, we aim to contribute to an account of how language can be used to communicate, i.e. a detailed description of how it contributes to the outcomes of interactions.

Pleading for money has a particularly long social history. It is a most representative class of language use encounters. The form we study here (a letter to a large set of people from a corporation organized for a narrow social cause) is contemporary. An essential part of success in this encounter is of course having a suitable number of addressees give money. To create the potential for such an outcome, the addressees must:

* know that money has been requested,
* know how to comply with the request,
* be motivated and willing to respond.

So to account for the ZPG letter as communication requires that we account for how it can produce at least these effects.

To use language as in the ZPG letter is not merely performing in some role or ritual as an institutional beggar; playing out a role can be done as an activity without consequences, and a view of language simply in terms of social roles would miss the point. Rather, the attempt to induce people to choose to give money is a characteristic, if not defining, attribute of this class of encounters. It is the attempt to get money by symbolic means that is the communicative essence of this class of encounters.

More generally, we want our discourse theories to provide paths or mappings both from situation to language, explaining how or why particular uses of language were chosen, and from language and situation to effect, explaining why particular uses of language succeeded or failed. For the latter, the most obvious fulfillment in the theory presented here is that it imputes to the speaker desires for particular effects. This element distinguishes it from many other approaches to discourse description. Most

often, discourse descriptive methods have no place for intended effects. although frequently the developers of the methods will acknowledge them.

Certain kinds of presentations, texts, have a kind of wholeness or integrity that others lack. We recognize that they "hang together" and are understandable as single objects. They are coherent. Every element has some role in the whole text: otherwise the text contains a nonsequitur. This is the sense in which we see magazine articles as texts, but magazines, news broadcasts, and some dialogues as structured collections of texts.

A theory of textual communication should account for this coherence: if it is an organizational theory then it should account for the presence or absence of nonsequiturs. To account for nonsequiturs, the theory must assign (or appropriately fail to assign) a status to every part of the text. One of our aims in creating a theory of communication is this kind of comprehensive assignment of status. This is not to say that there is anything wrong with selective commentary or partial theories, except that they cannot by their nature account for the impression of unity or integrity that is one of the identifying marks of texthood.

2 Varieties of Structure

The term "structure" in this paper is used in an organizational sense.[1] The name of the theory, Rhetorical Structure Theory (RST), employs this sense. A theory of text structure describes what sorts of parts texts have, and the principles of combination of parts into entire texts. Since the term is widely used in many senses, we

[1]This is distinct from some other uses in discourse analysis, e.g. for describing referential recurrence.

attempt to sketch here the various kinds of structure that RST recognizes, and within those the scope of the theory itself.

Even in our narrow sense of the term, RST does not attempt to describe all of the kinds of structure that a text may have. It recognizes three principal kinds:

1. Holistic Structure -- structure deriving from the properties of the genre or variety of text, used in this case to describe the form of letters and account for expressions such as *Sincerely*.

2. Relational Structure -- structure expressing the organization of coherent contiguous text, used in this case to describe the internal composition of the body and P.S. of the letter.

3. Syntactic Structure -- as the term is commonly used.[2]

As will be seen below, RST is a theory of relational structure. It acknowledges other kinds, interacting strongly with holistic and syntactic structure, but it does not attempt to incorporate accounts of either genre or syntax. In the interaction, there are alignments of the various sorts of structure, so that often a particular arrangement, such as a combination of clauses, can be described in more than one way. The varieties of structure interpenetrate and illumine each other, making descriptions in terms of these perspectives particularly interesting. One of the consequences of this interpenetration is that there is no sharp boundary, either in principle or in practice,

[2]RST can interface with different theories of syntactic structure. However, the nature of the 'interface' between rhetorical structure and syntactic structure may vary quite significantly depending on the nature of the syntactic theory. In general, functional theories of syntactic structure will simplify the interface considerably. The treatment of so-called subordinate clauses is a case in point: see Section 7.2.

between the different varieties.[3]

3 Introduction to Rhetorical Structure Theory

For several years there has been a research effort at USC Information Sciences Institute (ISI) aimed at describing written discourse. The original motivation for this research was that its results might be useful as a theoretical basis in designing computer programs with some of the capabilities of authors. The effort has ranged beyond this limited goal, and resulted in an understanding of discourse that has had many other uses, including several applications in linguistics. The effort has involved a study of the nature of text as a medium of communication, with an interest in developing a theory of text structure that could serve both as an analytical tool and as a tool for text generation. We call this theory Rhetorical Structure Theory (RST), since it provides a framework for describing rhetorical relations among parts of a text.[4]

In the construction of this theory we have analyzed more than 400 texts, from one paragraph to several pages in length, of the following types: administrative memos,

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[3]In RST, the approach to theorizing is to treat theories as components of an account rather than as monolithic. While we do not select any particular theory of holistic structure, the systemic theory of generic structure, [Hasan 78], [Halliday & Hasan 88], or macrostructure theory, [van Dijk 72], [van Dijk 77], [van Dijk 80] offer possibilities. In each case the theory provides much more than just a correlate of holistic structure. RST also has strong interactions with independent theories of Thematic Structure, i.e. the establishment and maintenance of topics, and with Exchange Structure, i.e. dialogue structure, but these interactions are beyond the scope of the paper (see Section 8).

[4]We gratefully acknowledge the valuable input provided by Cecilia Ford, Barbara Fox, and Peter Fries in the development of RST. We express special thanks to Peter Fries for his comments on the analysis of the ZPG text.

RST extends a tradition of research on the relational basis of text structure. The unabridged version of [Mann & Thompson 89] ([Mann & Thompson 87a]) contains a substantial discussion of the relationships between, and the influence upon, RST and other relational studies of text, including the work of Beekman, Callow, Grimes, Grosz, Halliday, Hasan, Hobbs, Hoey, Jordan, Kopesec, Longacre, Martin, Mckeown, Meyer, Pike, Sidner and Winter. Other major papers on RST include [Mann & Thompson 87b] and [Mann & Thompson 88].

personal letters, letters to the editor, advertisements, Scientific American articles and abstracts, newspaper articles and editorials, organizational newsletter articles and appeals (as exemplified in the Zero Population Growth letter that is the focal text of this book), public notices in magazines, travel brochures, and recipes.

In the course of examining these texts, we observed that many phenomena of text structure involved pairs of regions of the text. The mutual relevance of the two parts, and sometimes their position and form, could be identified with recurrent relations holding between the parts. These relations, sometimes but not always indicated by conjunctions, could hold between text parts of a wide range of sizes, from clauses to groups of paragraphs. These observations led to the formation of a testable set of assumptions (described below) and to the realization of these assumptions in the mechanisms of RST.

RST describes texts in a rich and highly constrained way and thus predicts much about their character and effects. It describes functions and structures that make texts effective and comprehensible tools for human communication.

3.1 Underlying Assumptions

Our observations about text structure have led to a number of basic assumptions underlying RST:

1. Organization -- Texts consist of functionally significant parts; the parts are elements of patterns in which parts are combined to create larger parts and whole texts. The assumption that text is organized is not controversial: the opposite -- that texts do not commonly have an internal organization -- is not defended seriously in the linguistic literature.

2. Unity and Coherence -- To be recognized as a text, the writing must create a sense of overall unity to which every part contributes. The presence of this unity and coherence is uncontroversial, but there are diverse views of its source.

3. Unity and Coherence Arise From Imputed Function -- A (region of) text is perceived as having unity and coherence because all of its parts are seen as contributing to a single purpose of the writer, i.e. as created to achieve a single effect. As an alternative, some have assumed that unity and coherence come from conformity to a familiar pattern in the subject matter, such as a temporal sequence or repeated reference to a character. Others find it in more abstract semantic patterns, such as hyponomy and metonymy.

4. Hierarchy -- Text are organized such that elementary parts are composed into larger parts, which in turn are composed into yet larger parts up to the scale of the whole text. Without specifying the nature of the parts or the principles of composition, the assumption of hierarchy contrasts with other assumptions about the patterns of text structure. For example, one could assume that text structure is formed by adjacency patterns or by linearly related chains of clauses or semantic propositions.

5. Homogeneity of Hierarchy -- As indicated above, RST describes relational structure and its interaction with holistic and syntactic structure. Within relational structure, RST assumes homogeneity: there is one set of structural patterns available for organizing the text at every scale, from the largest, an element of holistic structure (e.g. letter body, magazine article body, possibly the whole text...) down to the smallest scale (possibly a two-clause combination). This set of patterns is identified as RST **schemas** (to be further discussed below). The potential for relational organization does not vary with scale; frequencies will vary with scale, genre and other influences. There are no conventional patterns at scales between the RST schema and the element of holistic structure. An alternative assumption might be that there is a rank-scale or size-scale of objects, e.g. sections and paragraphs, which each have their own distinct functional descriptions and principles of relational composition.

6. Relational Composition -- The principal structural pattern in multisentential text is relational: a small set of highly recurrent relations holding between pairs of parts is used to link parts together to form larger parts. There are several kinds of alternative assumptions used by various researchers. In one, structural patterns are patterns of constituent categories (analogous to the mechanisms of certain grammars). In another, structural patterns are by nature semantic; they are necessarily patterns of subject matter, e.g. temporal or causal chains. Note that RST does not assume that all structuring is relational, nor that relational structure excludes semantic structuring, nor that all patterns are based on simple pairs. The RST assumption is that relational patterns are strongly dominant.

7. Asymmetry of Relations -- The most common type of text structuring relation is an asymmetric class, called nucleus-satellite relations in RST.

This class is asymmetric because one member of a pair of text spans is more central (the **nucleus**) and one more peripheral (the **satellite**). Further, a text part that is the nucleus for some text-structuring relation will have functional similarities with other nuclei. There are other theories of text structure that also recognize this asymmetry (cf. [Grimes 75], [van Dijk 85], [van Dijk 81] and the Longacre, Meyer and Pike papers in the volume that is to include this paper, [Mann & Thompson 90], as well as the references that they cite.)

8. Nature of Relations -- Text structuring relations are functional; the character that they all share can be stated in terms of the categories of effects that they produce. They can be described in terms of the purposes of the writer, the writer's assumptions about the reader, and certain propositional patterns in the subject matter of the text. The text structuring relations reflect the writer's options of organization and presentation; it is in this sense that an RST structure is "rhetorical."

   In contrast, one could assume that text structuring relations simply represent relations in the subject matter (e.g. of succession, cause or conditionality.)

   Strictly speaking, the relations of a text do not hold between the various word sequences of which the text consists. Rather, the word sequences are realizations of more abstract entities: meanings and intentions that are represented by those word sequences. In this sense all of RST is pre-realizational, since it makes statements about how such meanings and intentions are structured and combined, but not about how they are realized. It is inconvenient to acknowledge the abstraction on every mention, so we will generally say that relations hold between spans of text, but the distinction between the abstract entity and its realization always remains.

   Although RST identifies the nature of text structuring relations as functional, it does not presume any particular function. Discovery of the relations and their functions is however an empirical matter. In research, a great deal of misunderstanding and misrepresentation of language has come from assuming that the sole or principal function of language is informing, and that it therefore operates as a message passing medium, a code. This agrees with the outlook and metaphors of our culture (*content*, *convey*, *message*, language as a conduit [Reddy 79]), but it does not stand up to careful examination; see for example the abundant exceptions to that view in [Larkin & O'Malley 73]. The relations in fact perform a diversity of functions; some are involved with informing, but many perform presentational and social functions with little informative value. If one sees the function of text as predominantly informing or message-passing, then one is led to a view that text structure performs predominantly a representational function. This can be mitigated by a broad definition of "message," but not corrected.

Another alternative is to assume that the knowledge of text structuring relations is a variety of lexical knowledge, e.g.. of conjunctions. This assumption would be most reasonable if the relations were always signalled explicitly. (Something close to this assumption can be arrived at by beginning one's investigation with the conjunctions and discovering relations from them.) In RST the relations are not identified with any particular ways in which they are represented. Most of them, but not all, can be made accessible to the reader by conjunctions, often a variety of conjunctions, and all of them can be conveyed in other ways, including being fully implicit. The assumption that text structuring relations are lexical is an alternative, not compatible with RST.

9. The Number of Relations -- The set of text structuring relations is in principle open, so that additional previously unused relations can arise. However, the frequency of creation of new relations is extremely low, and for all but a kernel set the frequency of use of rare or unknown relations is also extremely low, so that text in a culture can be analyzed virtually entirely in terms of a small set of highly recurrent relations, the knowledge of which is shared in the culture. The relations can be arranged in a taxonomy, with the particular number of relations reflecting definitional splitting and joining of taxonomic categories. An alternative assumption might be that the set of relations used in a particular culture and situation is drawn from a fixed universal set, possibly not yet fully documented, but in principle not expandable.[5]

In this paper, we use these assumptions to help characterize RST and to clarify the analysis at points where the assumptions become crucial. The assumptions are in fact built into the mechanisms of RST. Many correspondences of these assumptions to RST's mechanisms will be evident as the latter are described below. Space limits prevent explaining the correspondence here. For a more detailed treatment of RST's mechanisms, see [Mann & Thompson 88] and [Mann & Thompson 89].

The use of RST to investigate a number of linguistic issues serves to validate RST's assumptions. Some of the relevant studies are described below.

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[5]A paper currently in preparation refutes this alternative assumption by showing evidence for a particular mechanism for expanding the set of relations in culture-specific ways. [Mann 90]

First, RST provides a general way to describe the relations among organizational elements in a text, whether or not those relations are grammatically or lexically signalled. Thus, RST is a useful framework for relating the meanings of conjunctions, the grammar of clause combining, and non-signalled parataxis (For discussion, see [Matthiessen & Thompson 89], [Thompson & Mann 86] and [Thompson & Mann 87].)

Second, descriptive RST has been used as an analytical tool for a wide range of text types. [Noel 86] shows how it can be used to characterize news broadcasts. [Fox 87] demonstrates how explanations of the choice between pronoun and full NP in expository English texts can be derived from the organizational structure revealed by RST.

Third, descriptive RST lays a foundation for studies in contrastive rhetoric. Cui's analysis of Mandarin and English essays [Cui 85] is an example.

Fourth, RST has proven to be useful in analyzing narrative discourse as well. [Kumpf 86] is a study of the interlanguage of Japanese and Spanish speakers. The author shows that RST is valuable in describing the grammatical and rhetorical properties of the narratives produced by these speakers.

Finally, RST provides a framework for investigating Relational Propositions, which are unstated but inferred propositions that arise from the text structure in the process of interpreting texts (see Section 7.1 and [Mann & Thompson 86]). Since the coherence of a text depends in part on these Relational Propositions, RST has been useful in the study of text coherence.

3.2 Terminology and mechanisms of RST

The key elements of RST are **relations** and **spans.**[6] Essentially, the relation definitions identify particular relationships that can hold between two text spans.

A **text span** is any portion of text that has an RST structure (and thus has a functional integrity, from a text-organizational point of view), or that is realized by a **unit.** Units, defined in Section 3.3, are typically clauses. (For convenience we also speak informally of the region of text that realizes a text span as being a text span.) In general, a text span will not be interrupted by another text span, but defining text spans in functional terms rather than strictly orthographic terms allows for interrupted text spans. Section 8 discusses an instance of an interrupted text span in the analysis of the ZPG letter.

The notion of the structure of a text is defined in terms of the network of relations among successively larger text spans.

Relations are defined to hold between two non-overlapping text spans called the **nucleus** and the **satellite.** A relation definition consists of two fields:

1. ***Constraints:*** *including* a set of constraints on the nucleus, a set of constraints on the satellite, and a set of constraints on the combination of nucleus and satellite.

2. **Effect:** including a statement of the effect that plausibly the writer was attempting to produce in employing the relation, and (derived from that statement) the locus of effect, identified as either the nucleus alone or the nucleus-satellite combination.

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[6]For a more formal discussion of the mechanisms of RST, including a set of detailed relation definitions, see [Mann & Thompson 88].

We can see how these fields function to specify a relation definition by taking as an example the definition of the **Evidence** relation, shown in Figure 1.

1. Constraints:

   a. Constraints on the Nucleus: The reader might not believe the nucleus to a degree satisfactory to the writer.

   b. Constraints on the Satellite: The reader believes the satellite or will find it credible.

   c. Constraints on the combination of Nucleus and Satellite: The reader's comprehending the satellite increases his or her belief of the nucleus.

2. Effect:

   a. The reader's belief of the nucleus is increased.

   b. Locus of the Effect: Nucleus.

Figure 1: Definition of the Evidence Relation

The **Evidence** relation is appropriate to relate two text spans one of which (the evidence satellite) provides evidence for the claim put forth in the other (the nucleus). As an example we can consider this extract from a letter to the editor of BYTE magazine; the writer is praising a federal income tax program published in a previous issue. Here Unit 2 provides evidence for the claim in Unit 1, as diagrammed in Figure 2.

1. The program as published for calendar year 1980 really works.

2. In only a few minutes, I entered all the figures from my 1980 tax returns and got a result which agreed with my hand calculations to the penny.

The Effect field in a relation definition specifies the intended effect on the reader of that particular relation. In the case of the **Evidence** relation, for example, part a. of

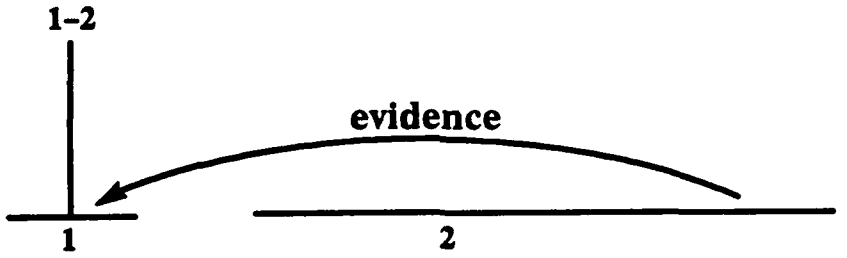

Figure 2: RST Diagram of the Tax Program Letter

the Effect field stipulates that the writer intends that the effect of using the Evidence relation is to increase the reader's belief in the nucleus. Thus in the case of the BYTE magazine example, the analysis reflects the judgment that the writer's purpose in including the satellite Unit 2 was to increase the reader's belief in the claim that *the program really works.* Since every definition has an Effect field, the analyst can thus provide a plausible reason the writer might have had for including each part of the whole text.

The relation definition does not constrain the order of spans, and for virtually every relation, both of the possible orders nucleus-satellite and satellite-nucleus are found.

Closely related to the functionality of the Effect field is the functionality of nuclearity. Informally, we speculate that nuclearity influences the way the reader assigns different roles to different parts of the text. If the satellite gains its significance through the nucleus, the writer can indicate, by the inherent nuclearity of the relation used, that the nucleus is more deserving of response, including attention, deliberation, and reaction.

The Locus of Effect field thus allows us to distinguish between those relations whose locus of effect is the nucleus from those whose locus of effect is both the nucleus and the satellite.

When the locus of effect is the nucleus, as in the **Evidence** relation, nuclearity represents the qualitative differences between the essential and the inessential. The satellite supports the nucleus, but does not contribute to it. When the locus of effect is both nucleus and satellite, a different sort of function is performed: the relation is expressing particular characteristics of the subject matter.

For example, a relation whose locus of effect is both nucleus and satellite is the **Circumstance** relation. The definition of the **Circumstance** relation specifies that the satellite sets a subject matter framework within which the nucleus can be interpreted. The intended effect is simply that the reader should recognize that the situation presented in the satellite provides the framework for interpreting the nucleus; its locus is thus both the nucleus and the satellite.

As an example of the **Circumstance** relation, consider this extract from an ad for computer disks, as diagrammed in Figure 3.

1. Cleaning agents on the burnished surface of the Ectype coating actually remove build-up from the head,

2. while lubricating it at the same time.

The locus of the effect of the **Circumstance** relation is both nucleus and satellite: the intended effect is that the reader recognize that the satellite (*while lubricating it at the same time*) provides a framework within which to interpret the nucleus (*Cleaning agents ... actually remove build-up*).

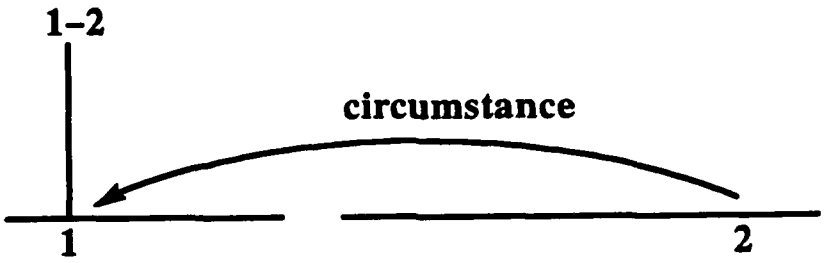

Figure 3: RST Diagram Showing the Circumstance Relation

The nuclearity of the **Circumstance** relation, where the locus of effect is both the nucleus and the satellite, is thus quite different from the nuclearity of the **Evidence** relation, where the locus of effect is just the nucleus. Where the locus of effect is just the nucleus, nuclearity reflects the supporting role of the satellite; where the locus of effect is both the nucleus and the satellite, nuclearity reflects the symbiotic role of the nucleus and the satellite in the reader's recognition of subject-matter relationships.

Each field of a relation definition specifies particular judgments that the text analyst must make in building the RST structure. Since the analyst has access to the text, has knowledge of the context in which it was written, and shares the cultural conventions of the writer and the expected readers, but has no direct access to either the writer or other readers, judgments about the writer or readers must be plausibility judgments rather than judgments of certainty. That is, every judgment of the completed analysis is of the form, *It is plausible to the analyst that* .... In the case of the Effect field, for example, the analyst is judging whether it is plausible that the writer desires the specified effect on the reader.

3.3 Steps in performing an RST analysis

The first step in analyzing a text is to divide it into **units.** Unit size is arbitrary in RST; in principle the units can be of any size from typical lexical items to entire paragraphs or larger. In our work on RST, however, we have found it useful to use units that have some relatively theory-neutral functional integrity. We have derived interesting results from considering the units to be roughly clauses, except that clausal subjects and objects and restrictive relative clauses are considered parts of their host clauses rather than separate units.[7][8] The units we are working with here, then, are typically located at the boundary region shared by relational structure and syntactic structure. Larger units may be useful for various other purposes, such as describing the overall structure of larger texts.

The next step is to identify spans and relations, working either from the top down (progressive refinement) or from the bottom up (aggregation), or both, as deemed convenient. Again, in determining what relation should be said to hold between two

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[7]The rationale for this is that these clauses are embedded constituent parts in other structures but they do not combine with other clauses in terms of relational structure. Thus, subject and object clauses enter into and are determined by the transitivity structure of the clause they are embedded in. In contrast, non-embedded clauses may be related to one another as wholes and form rhetorically motivated clause combinations.

[8]On this basis we have broken down some of the segments of the ZPG letter into parts designated with subscripts A, B, and C as follows. Subscript A always designates the first part of the segment.

6B: answering questions
6C: and talking with reporters .... country.
7B: we had no idea .... response.
11A: ZPG's Urban Stress Test, ... is the nation's first survey ... cities.
11B: created after months of persistent and exhaustive research,
14B: we urgently need your help.
15B: and our modest resources are being stretched to the limit.
19B: we can act to take positive action at the local level.
21B: both elected officials .... study.
30B: by completing the enclosed reply form.

given text spans, the analyst is asking at each point whether the relation definition plausibly applies. Notationally, we represent nuclei under vertical lines and satellites at the ends of arcs, as shown in Figure 4, which shows the schema representing the top level organization of the body of the ZPG letter. While the schema is a technical device in the more elaborate definition of RST, here we can think of it simply as an iconic convention, showing how units and relations are grouped. In the case of nucleus-satellite relations, the grouping consists of one nucleus and all of its satellites.

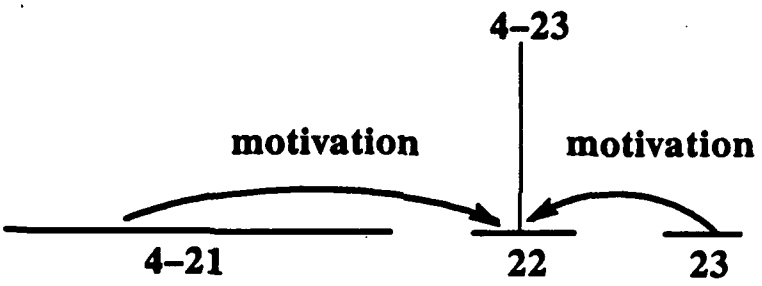

Figure 4: Highest Level RST Schema Diagram
for the ZPG Letter

As in other kinds of analysis of linguistic structure, RST sometimes yields multiple analyses for a text. There are various sources of this multiplicity, one of which is ambiguity of discourse structure. We present a single analysis below; there are comments on alternate analyses of the text in Section 5.

The set of relations in RST is not a closed set. Among those which we have found useful are the following:

Nucleus-Satellite Relations

Evidence	**Justify**	**Antithesis**
Concession	**Circumstance**	**Solutionhood**
Elaboration	**Background**	**Enablement**
Motivation	**Volitional Cause**	**Non-volitional Cause**
Volitional Result	**Non-volitional Result**	**Purpose**
Condition	**Otherwise**	**Interpretation**
Evaluation	**Restatement**	**Summary**

Multi-nuclear Relations

Sequence	**Contrast**	**Joint**

Precise definitions for all these relations, and of the conditions under which they can be applied, can be found in [Mann & Thompson 89]. Here we will be concerned only with those relations that figure in our analysis of the ZPG letter, whose definitions can be found in the Appendix.

The role of subjective judgment in the theory should be made clear. To account for communication as one of the principal functions of language, a linguistic theory must be functional, in the sense that it must provide representations and draw conclusions about what the functions of particular uses of language are. If a linguistic theory of text structure is to be functional, judgments about the functions of texts and text parts must be made in the process of creating and testing the theory. In practice, such judgments are necessarily subjective, since they are made only by human beings who communicate, on the basis of what they know about their culture, their society, and their language.

This kind of judgment has of course been applied frequently in developing RST (and every other account of language function). In addition, RST employs subjective

judgments in another, more controversial role. They are used not only in evaluating an analysis, but in producing it. We use this approach in RST because it is an effective way to develop functional descriptions of text, as a step toward ultimately coming to understand communication. Texts are complex objects, with correspondingly complex functional descriptions. To arrive at such descriptions, as our general goals require, it is necessary to develop and combine many smaller functional descriptions.[9]

The specific representation of this kind of judgment in RST is that, as mentioned above, the analyst affirms certain statements about the text and the writer as plausible rather than factual. Related to this approach is the fact that RST relations are defined without referring to particular textual patterns; the **Purpose** relation is defined without reference to *in order to*. This intentional lack of explicit hooks makes such judgments essential.

4 RST Analysis of the ZPG Letter

The original ZPG letter, used with permission, is shown in Figure 5. We have segmented it for analysis as shown in Figure 6. The integer segment numbers are based on visual subdivision, and the finer segmentation used in our analysis is explained below.

We expect that the holistic structure of letters is specified so that one of the alternatives is the sequence shown in Figure 7, possibly with more or less substructure

[9]Of course, there are methodological risks in approaching the problem in this way, risks of circularity, divergence of analysis from actual function, nonrestrictiveness of the theory, vagueness, indefiniteness of analytic outcome, etc., but in today's linguistics, descriptions must be produced through human judgments of function if they are going to be produced at all. These issues have been faced and some progress made, but there are no guarantees.

Zero Population Growth

November 22, 1985

Dear Friend of ZPG:

At 7:00 a.m. on October 25, our phones started to ring. Calls jammed our switchboard all day. Staffers stayed late into the night, answering questions and talking with reporters from newspapers, radio stations, wire services and TV stations in every part of the country.

When we released the results of ZPG's 1985 Urban Stress Test, we had no idea we'd get such an overwhelming response. Media and public reaction has been nothing short of incredible!

At first, the deluge of calls came mostly from reporters eager to tell the public about Urban Stress Test results and from outraged public officials who were furious that we had "blown the whistle" on conditions in their cities.

Now we are hearing from concerned citizens in all parts of the country who want to know what they can do to hold local officials accountable for tackling population-related problems that threaten public health and well-being.

ZPG's 1985 Urban Stress Test, created after months of persistent and exhaustive research is the nation's first survey of how population-linked pressures affect U.S. cities. It ranks 184 urban areas on 11 different criteria ranging from crowding and birth rates to air quality and toxic wastes.

The Urban Stress Test translates complex, technical data into an easy-to-use action tool for concerned citizens, elected officials and opinion leaders. But to use it well, we urgently need your help.

> Our small staff is being swamped with requests for more information and our modest resources are being stretched to the limit.

Your support now is critical. ZPG's 1985 Urban Stress Test may be our best opportunity ever to get the population message heard.

1601 CONNECTICUT AVENUE, NW ■ WASHINGTON, DC 20009 ■ (202) 332-2200

With your contribution, ZPG can arm our growing network of local activists with the materials they need to warn community leaders about emerging population-linked stresses before they reach the crisis stage.

Even though our national government continues to ignore the consequences of uncontrolled population growth, we can act to take positive action at the local level.

Every day decisions are being made by local officials in our communities that could drastically affect the quality of our lives. To make sound choices in planning for people, both elected officials and the American public need the population-stress data revealed by our study.

Please make a special contribution to Zero Population Growth today. Whatever you give -- $25, $50, $100 or as much as you can -- will be used immediately to put the Urban Stress Test in the hands of those who need it most.

Sincerely,

Susan Weber
Executive Director

P.S. The results of ZPG's 1985 Urban Stress Test were reported as a top news story by hundreds of newspapers and TV and radio stations from coast to coast. I hope you'll help us monitor this remarkable media coverage by completing the enclosed reply form.

Figure 5: The Original Form of the ZPG letter

Segment 1 ZERO POPULATION GROWTH

Segment 2 November 22, 1985

Segment 3 Dear Friend of ZPG:

Segment 4 At 7:00 a.m. on October 25, our phones started to ring.

Segment 5 Calls jammed our switchboard all day.

Segment 6 Staffers stayed late into the night, answering questions and talking with reporters from newspapers, radio stations, wire services and TV stations in every part of the country.

Segment 7 When we released the results of ZPG's 1985 Urban Stress Test, we had no idea we'd get such an overwhelming response.

Segment 8 Media and public reaction has been nothing short of incredible!

Segment 9 At first, the deluge of calls came mostly from reporters eager to tell the public about Urban Stress Test results and from outraged public officials who were furious that we had "blown the whistle" on conditions in their cities.

Segment 10 Now we are hearing from concerned citizens in all parts of the country who want to know what they can do to hold local officials accountable for tackling population-related problems that threaten public health and well-being.

Segment 11 ZPG's 1985 Urban Stress Test, created after months of persistent and exhaustive research, is the nation's first survey of how population-linked pressures affect U.S. cities.

Segment 12 It ranks 184 urban areas on 11 different criteria ranging from crowding and birth rates to air quality and toxic wastes.

Segment 13 The Urban Stress Test translates complex, technical data into an easy-to-use action tool for concerned citizens, elected officials and opinion leaders.

Segment 14 But to use it well, we urgently need your help.

Segment 15 Our small staff is being swamped with requests for more information and our modest resources are being stretched to the limit.

Segment 16 Your support now is critical.

Segment 17 ZPG's 1985 Urban Stress Test may be our best opportunity ever to get the population message heard.

Segment 18 With your contribution, ZPG can arm our growing network of local activists with the materials they need to warn community leaders about emerging population-linked stresses before they reach crisis stage.

Segment 19 Even though our national government continues to ignore the consequences of uncontrolled population growth, we can act to take positive action at the local level.

Segment 20 Every day decisions are being made by local officials in our communities that could drastically affect the quality of our lives.

Segment 21 To make sound choices in planning for people, both elected officials and the American public need the population-stress data revealed by our study.

Segment 22 Please make a special contribution to Zero Population Growth today.

Segment 23 Whatever you give -- **$25, $50, $100** or as much as you can -- will be used immediately to put the Urban Stress Test in the hands of those who need it most.

Segment 24 Sincerely,

Segment 25(handwritten signature)

Segment 26 Susan Weber
Segment 27 Executive Director

Segment 28 P.S.

Segment 29 The results of ZPG's 1985 Urban Stress Test were reported as a top news story by hundreds of newspapers and TV and radio stations from coast to coast.

Segment 30 I hope you'll help us monitor this remarkable media coverage by completing the enclosed reply form.

Figure 6: The Segmented Form of the ZPG letter

or grouping than is shown. The body and P.S. elements of this sequence are specified as potentially having relational structure.

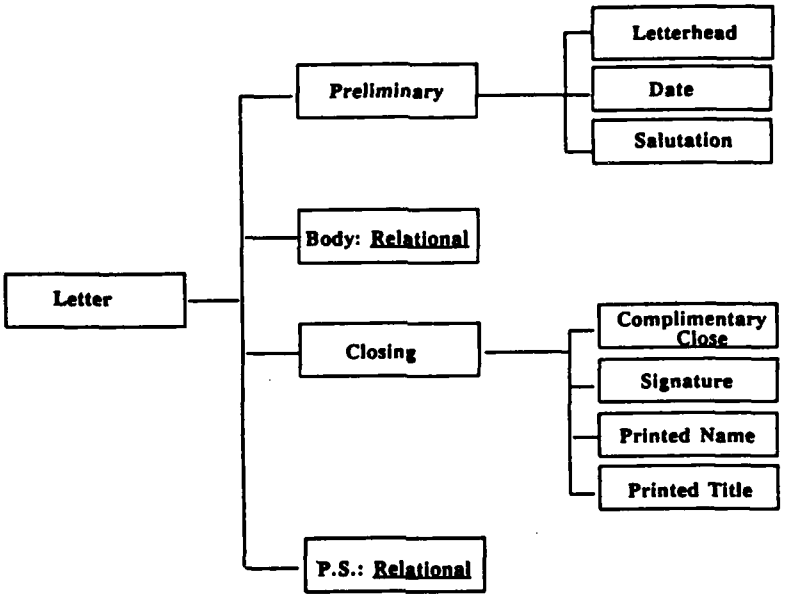

Figure 7: Holistic Structure Sequence for the ZPG *Letter*

The RST analysis of the ZPG letter is given in Figure 8. In this section, we will discuss the analysis and the rationale for the judgments we have made.[10] All numbers refer to units.

The topmost level of our analysis recognizes certain conventional properties of a letter which we consider not to be part of its relational structure, since, as pointed out in Section 2, they are part of the holistic structure; they are included as part of what we know about the form of letters of this kind in our culture. Thus 1 is a letterhead logo, 2 is the date, and 3 is the greeting. The body of the letter is 4 - 23, which has an RST

[10]Recall that all of these judgments are plausibility judgments. Thus, though the analysis is presented as if it were "truth", each analytical statement in it should be read as *It is plausible that the writer intended ....*

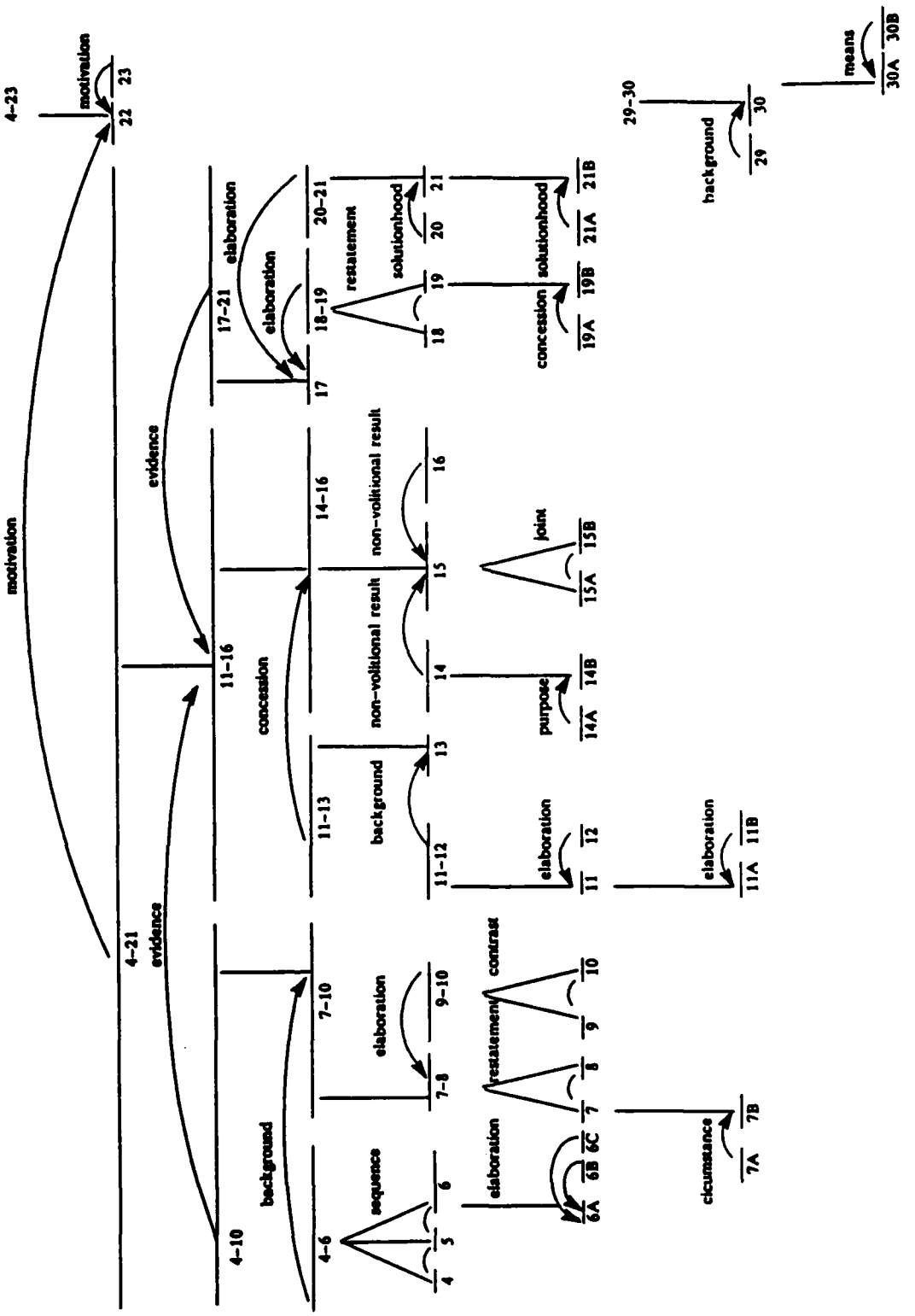

Figure 8: RST Diagram for the Body of the ZPG Letter

analysis, to be discussed below. Units 24 - 27 constitute the closing, and 28 - 30 comprise the P.S., whose internal structure can also be described by an RST analysis.

Before discussing the body of the letter, let us briefly discuss the RST analysis of the P.S., 28 - 30. The analysis reflects the afterthought nature of a P.S. by attributing it to the holistic structure associated with letters, and not taking it as a discontinuous element of the body of the letter. Internally, we have considered it to consist of a **Background** satellite (29) to the nuclear 30, which itself is composed of a nucleus (30A) and a **Means** satellite (30B). According to its definition, the **Background** relation is appropriate for 29 - 30: the satellite 29 increases the reader's ability to comprehend an element in the nuclear 30 (namely *this remarkable media coverage*).

We will have no more to say here about the opening 1 - 3, the closing 24 - 27, or the P.S.. Further reference to *the text* will be to the body of the letter, 4 - 23.

Let us now turn to the RST analysis of the body of the letter. The diagram in Figure 8 reflects the intuition that the nuclear unit of the entire text (that reached by tracing from the top of the RST structure (here the node labeled 4 - 23) through vertical lines) is 22. This is appropriate because the purpose of the letter is blatantly to seek contributions, and it is in 22 that the appeal is stated in its most directive fashion: *Please make a special contribution to Zero Population Growth today.*

Supporting the nuclear appeal in 22 are two **Motivation** satellites, which together constitute the remainder of the text. Thus, the RST analysis reveals the functional structure of this letter to consist of a nuclear request accompanied by several paragraphs motivating the reader to comply with the request.

Taking the smaller **Motivation** portion first, we note simply that 23. assuring readers that their contribution will be put to good use, is the final sentence in the letter -- a last-ditch effort at motivating readers to give money.

The larger **Motivation** chunk is the entire body of the letter preceding the request, comprising 4-21. According to the RST diagram, this text span consists of a nuclear claim 11-16, which tells readers how badly their help is needed, flanked by two pieces of evidence for that claim, 4-10 and 17-21. Let us now consider the internal structure of each of these pieces of evidence.

The first piece of evidence, consisting of 4-10, is thematically unified around the public reaction to the release of the results of the Urban Stress Test. That is, this span provides evidence for the claim that readers' help is needed by detailing how ready the public is for the ZPG message that the Urban Stress Test provides.

The nucleus of this segment is 7-10, which describes the unexpected public response to the Test results. As **Background** to this nuclear claim, we find the narrative sequence in 4-6, describing the events of the day the Test results were released. These narrative Units 4-6 are related to each other by the multi-nuclear relation **Sequence**. Note that within this sequence, 6 can be subdivided into a nuclear 6A plus two **Elaboration** satellites, 6B and 6C.

Looking more closely now at the nuclear span of this first **Evidence** satellite, 7-10, we see that this span consists of the nuclear pair 7-8, and an **Elaboration** satellite. Units 7-8 are related to each other by the bi-nuclear relation **Restatement**. That is, 8 restates the content of 7, the idea that the public response has been

overwhelming and *incredible.* (Note that 7 itself consists of a nuclear 7B preceded by a *when*-clause in a **Circumstance** relation.)

Finally, 9-10, the elaboration of 7-8, generalizing the reactions during the first month after the release of the Test results, are related to each other by the bi-nuclear relation **Contrast.** That is, 9 contrasts with 10 in that 9 gives the initial reactions, coming from *reporters* and *outraged public officials*, while 10 gives the less immediate and more moderate reactions from *concerned citizens in all parts of the country.*

The first piece of evidence, then, for the claim that readers' help is needed, is the portion of the text describing the positive reactions to the results of the Urban Stress Test.

The second piece of evidence for this assertion that help is needed is the span 17-21, thematically discussing the role that the Test can play in raising public consciousness about population-related problems in cities.

The nucleus of this span is 17, which claims that the Urban Stress Test may be the best way to disseminate the *population message*; it is followed by two **Elaboration** satellites.

The first of these **Elaboration** satellites, 18-19, consists of two spans in a **Restatement** relation: 19 restates (*we can take positive action at the local level*) what 18 conveys (*warn community leaders about population-related stresses*). Unit 19 itself consists of a **Concession** satellite 19A and a nuclear 19B.

The second of the **Elaboration** satellites is 20-21. Unit 20 is in a

Solutionhood relation with 21, and 21A is in a **Solutionhood** relation with 21B. Thus, the problem in 20, that local officials are faced with decisions that affect us, is solved by 21, providing them with the data from the Test to enable them to make sound choices. But 21 also consists of a problem and its solution: 21A presents the problem of making sound choices, and 21B presents the solution, which is to get the data to elected officials and the American public.

We have now described both of the **Elaboration** satellites in the **Motivation** span 4-21.

Before going on to the nucleus of this **Motivation** satellite, let us pause briefly to comment on a feature of Unit 21, namely its indirectness. As we have just suggested, the RST analysis claims that it is plausible to analyze 21 as presenting a solution to the problem in 20 of local officials making decisions that affect our daily lives. But a careful reading of 21 shows that it does not literally present such a solution, since all it says is that elected officials and the American public need the population-stress data. However it is clear in understanding 21 that the writer is suggesting that when the officials <u>have</u> the data it helps in solving their problem of making sound decisions. Analysis must take many kinds of indirectness of expression into account, including indirect speech acts, various kinds of hedging, metonymy and many other ploys.

Now let's turn to the nucleus (11-16) of the **Motivation** satellite whose two **Evidence** satellites we have just considered. Units 11-16 are related by the **Concession** relation: 11-13 form a **Concession** satellite to the nuclear 14-16.

Since this example of **Concession** is not as straightforward as that seen in

19A-19B, let's pause briefly to justify it. As discussed in [Thompson & Mann 86] and [Mann & Thompson 89], the **Concession** relation can be fruitfully thought of as involving apparent incompatibility but actual compatibility. The definition of **Concession** (see Appendix I) includes the provision that the writer intends the actual compatibility of the satellite and the nuclear spans to increase the reader's positive regard for the nucleus.

In these terms, the span 11-16 can be seen as contrasting 11-13, describing the positive attributes of the Urban Stress Test, with 14-16, which point out the desperate financial straits of ZPG. These two situations are potentially incompatible, since a lack of funds decreases the value of the Urban Stress Test. However, the writer views the two situations as compatible; they are compatible if readers respond with the needed funds. And she hopes to increase the reader's positive regard for the nuclear span describing the desperate financial straits by getting the reader to recognize the compatibility as well.

We hope to have convinced you that 11-13 are plausibly analyzed as constituting a **Concession** satellite to 14-16. Within this **Concession** satellite itself, 11-13, 13 is the nucleus, with 11-12 as an **Background** satellite. That is, 11-12 provide a basis for understanding the statement about "translation" in 13. Units 11-12, in turn, are in an **Elaboration** relation, with 12 providing details of 11, and 11B, the participial clause, is a further elaboration for 11A.

The nucleus of the **Concession** relation in 11-16 is 14-16. Within this span, 15 is the nucleus and 14 and 16 are satellites, each in a **Non-volitional Result** relation.

That is, 14 *we need your help* and 16 *your support is critical* are plausibly intended by the writer as results of the situation described in 15. Units 14A-B can be further analyzed in terms of the relation **Purpose**.

Finally, 15A and 15B together form a **Joint** Schema; that is, they jointly perform the double role described for 15, and none of the other RST relations holds between them, as specified by the definition of **Joint**.[11]

Our description of the RST analysis for the ZPG text is now complete. The analysis shows that the body of the ZPG letter can be understood as a request for donations (22), preceded by a lengthy portion (11 paragraphs) motivating readers to comply with this request. Within this motivation section, we have seen that a nuclear claim that help is urgently needed is flanked by two pieces of evidence for this claim. One of these pieces of evidence asserts that the Urban Stress Test has been very well received, and the other claims that the Urban Stress Test can be useful for ZPG action at the local level.

Now we can review the ways in which this particular analysis represents the general assumptions identified in Section 3.1.

The assumption of Organization (#1) is obviously represented by the structural analysis. The assumption of Unity and Coherence (#2) is represented by the fact that for each of the relational parts (the body and the P.S.) every part is incorporated into a single connected analysis. That unity and coherence arise from imputed function (#3)

[11]Recall that in a more formal presentation of RST there is another mechanism, called the schema, which is useful for specifying how relations can be combined on a single nucleus, and for handling various exceptional structures. In that treatment there is a Joint schema but no Joint relation.

is represented by the requirement that the analyst confirms the fit of the relation definitions used in the analysis, including the Effect field, according to which the analyst imputes to the writer an intention of effect for each relation employed. Roles in terms of intended effects are thus assigned to every part of the text. (The assumption that the nature of text structuring relations is functional (#8) is fulfilled in the same way.)

The assumptions of hierarchy (#4) and homogeneity of hierarchy (#5) are represented in RST's mechanisms, which produce a hierarchy by using the same mechanism at every level.

The assumptions on relational composition (#6) and the dominance of asymmetry (#7) are fulfilled in the analysis, since of the 31 terminal units, 23 stand in a nucleus-satellite relation, 6 in a multinuclear relation and only 2 in a Joint structure. In addition, there are 10 nonterminal nucleus-satellite relations and no multinuclear ones.

Finally, the assumption that in practice the number of relations is small (#9) is seen in this analysis, which uses 14 different relations to accomplish 30 links. A list of these relations is in Figure 9.

5 Alternative Analyses

It often happens that a text has more than one analysis; it is a normal and predictable outcome, given the way that RST is defined. We and others have had the experience of giving the same text to several analysts, who then created differing analyses, sometimes more than one from an individual analyst. There are several qualitatively different causes of this multiplicity:

Background	**Means**	**Motivation**
Evidence	**Concession**	**Elaboration**
Non-volitional Result	**Sequence**	**Circumstance**
Contrast	**Solutionhood**	**Joint**
Restatement	**Purpose**	

Figure 9: The Relations of the ZPG Letter

1. Boundary Judgments -- results of forcing borderline cases into categories.
2. Text Structure Ambiguity -- comparable to many other varieties of linguistic ambiguity.
3. Simultaneous Analyses -- multiple compatible analyses (see [Ford 87] for some discussion).
4. Differences Between Analysts -- especially, differing plausibility judgments.
5. Analytical Error -- especially by inexperienced analysts.

There is a well-known phenomenon associated with grammatical ambiguity, in which people initially regard a construct as unambiguous, and only later recognize that there are other analyses. This fixation on particular analyses arises in RST as well. This is seen when several analysts analyze the same text and then accept each other's analyses.

With experienced analysts, multiplicity of analyses represents primarily simultaneous analyses and text structure ambiguities. The particular role of the analyst causes bizarre analyses to be legitimately rejected, and so the actual levels of ambiguity are much lower than experience with formal grammatical analyses would lead one to expect.

Multiplicity of RST analyses is normal, consistent with linguistic experience as a whole, and is one of the kinds of pattern by which the analyses are informative.

By way of illustration, we take one such case from the ZPG letter: it concerns the appropriate analysis of the relation of 11-13 to 14-16. In Section 8 we justified labeling this relation **Concession**, acknowledging that this analysis might need justification. Indeed, this relation could be thought to be an instance of **Background**. However, we argue that **Concession** is more plausible.

Recall that 11-13 characterize the Urban Stress Test, while 14-16 bemoan the lack of resources and issue the first plea for financial support.

Before we consider the multiple analysis for these two spans, we briefly note that there are two analyses for the relation between 11-13 and 14-16 that, although initially attractive, are not real options. These are **Contrast** and **Antithesis**, since the two spans do not serve to compare two situations and contrast them on one or more points of difference, as required by the definitions of these two relations.

However, it is certainly plausible that 11-13 be analyzed as providing background to 14-16, according to our definition of **Background**, since it could be seen as containing information necessary for the interpretation of 14-16. See Figure 10 for a diagram of this alternative. Although this is a plausible analysis, we do not take backgrounding to be the primary function of 11-13 in this highly manipulative text. Rather, as suggested above, we claim that 11-13 are serving to highlight the appeal for funds in 14-16 by pointing out all the virtues of the Urban Stress Test as potentially incompatible with <u>using</u> it -- incompatible unless the needed funds are donated.

This case of multiple analyses seems to be a genuine case of what we call "Simultaneous Analyses"; that is, there are two compatible analyses, but one of them

appears, to the three of us at least, to be more plausible in terms of the perceived overall goals of the writer.[12]

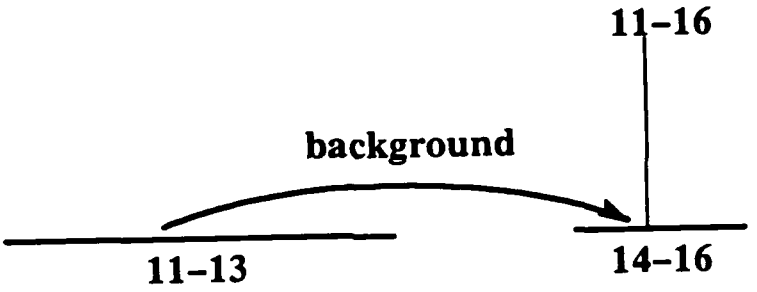

Figure 10: An Alternate Analysis of Units 11 through 16

6 Consequences and Inferences from the Analysis: Rhetorical Patterns

6.1 Centrality at the Whole-Text Level

One of the outcomes of an RST analysis is identification of a portion of the text that represents the essence of the text as a whole. It is called the **Comprehensive Locus of Effect**. It is arrived at by pruning the structure diagram as follows: Starting at the top (whole-text) node, trace down to each nucleus. For each relation linking nucleus to satellite, if the relation is defined to have a locus of effect that is the nucleus only, remove the satellite. Trace down repeatedly in the same way to all terminal units. The resulting "text", with some satellites deleted, is the comprehensive locus of effect.

In our experience this resulting "text" remains coherent and represents a kind of

[12]Our thanks to Peter Fries for discussion of this point.

ideational essence of the larger text. It is formally representative in the sense that the whole text is considered in deriving it.

For the ZPG letter body, the comprehensive locus of effect is simply segment 22: *Please make a special contribution to Zero Population Growth today.*, which certainly reflects the judgment that this letter is in essence an appeal for funds.

For the P.S. the comprehensive locus of effect is the second sentence: *I hope you'll help us monitor this remarkable media coverage by completing the enclosed reply form.* , which reflects the separate appeal being made in the P.S.

As one of the outcomes of a whole-text analysis, we can have some confidence that the comprehensive locus of effect does not misrepresent the text as an informal summary might, for example by focusing on only one portion.

6.2 A Presentational Pattern

The RST analysis brings out an interesting pattern in the organization of the ZPG text. As Figure 8 shows, there are three places in the analysis where a nucleus is flanked by two satellites of the same relation; these are reproduced in Figure 11.

This pattern is readily visible only with an analytical tool such as RST offers, in which there is a distinction between nuclear and satellite portions of the text. This pattern is somewhat unusual among the more than 400 texts we have analyzed. Without many more examples of this Satellite-Nucleus-Satellite pattern, we cannot be sure whether it reflects properties of the appeal-letter genre or habits of the author of this particular letter, but in either case it seems to reveal the repetitive mode in which

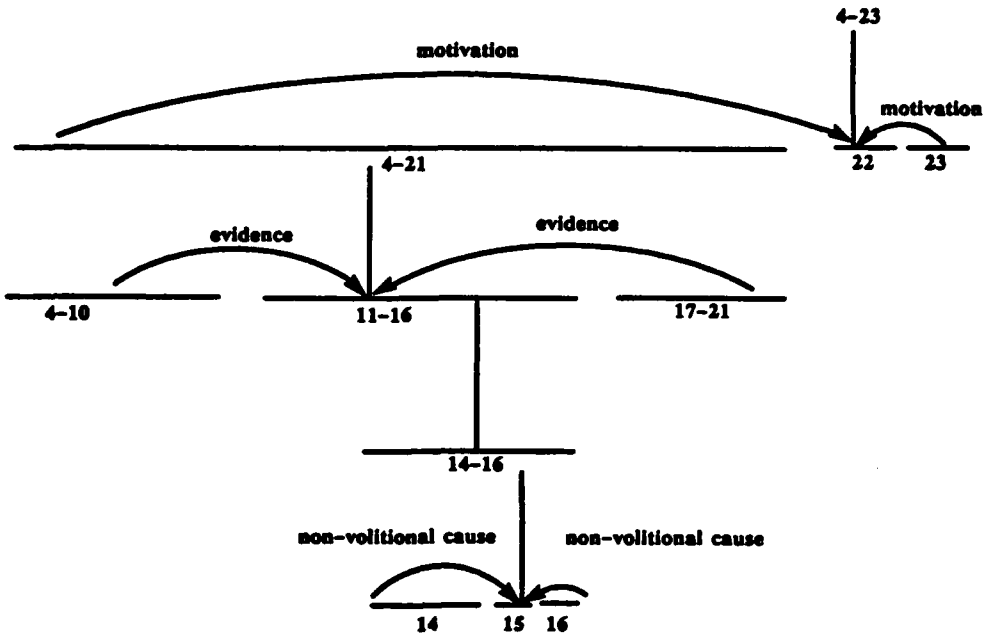

Figure 11: Satellite-Nucleus-Satellite Patterns in the ZPG Text

this appeal letter is written. That is, this Satellite-Nucleus-Satellite pattern highlights our feeling as readers that the letter is strongly organized around a mode of leading up to the point, stating the point, and driving it home.

7 Consequences and Inferences from the Analysis: Relations, Grammar and Lexis

7.1 Relations, Relational Propositions and Explicit Signals

Another kind of consequences of the text structure, labeled "relational propositions" in [Mann & Thompson 86], involves communication of information in the relational structure itself. The relations can communicate for the writer, just as clause structure or words can. Sometimes this communication is entirely implicit; sometimes it is signalled in various ways.

(By a **signal** of a relation we mean any single lexical, morphological or syntactic construct that regularly occurs in conjunction with the relation, and that can be taken

to represent (perhaps ambiguously) the presence of the relation. There are some complex patterns that are outside of this definition, and some possibilities for inferential recognition of relations that are outside of both of the above.)

For example, segment 20 talks about decisions by local officials *that could drastically affect the quality of our lives.* Segment 21 talks about these officials having the results of the study. In the analysis there is a **Solutionhood** relation between these two. The satellite (20) presents a problem of decision-making (or our living with the results), for which having the data is a (partial) solution. Mediating between these is the implicit idea that the quality of the decisions may be improved if they are informed decisions. A plausible inferential path would say that if the officials have the data, then they may use it in making decisions, and that if they use it, the quality of the decisions may increase, and that if the quality of the decisions increases then the quality of our lives may increase.

Having the data is thus a (partial and uncertain) solution to the problem of quality presented in segment 20. This claim of solutionhood is the relational proposition; it is conveyed by the solutionhood relation itself, and is not explicitly signalled. It is this solutionhood that makes the satellite relevant; even though the claim is obviously quite tenuous, if it were denied (say, elsewhere in the text) then segment 20 would become a nonsequitur and the coherence of the text as a whole would thus be broken.

Relational propositions have a status comparable to that of the explicit assertions of the text. The writer is responsible for their veracity, and can be quoted as claiming their truth.

Relational propositions affect our interpretation of texts in two ways. They help explain the significance of various kinds of structure-indicating signals when they are present. In the absence of signals, they indicate the basis of coherence of texts and specify part of what the text communicates. For some texts, recognizing this kind of implicit communication is crucial to explaining the text as a means of communication.

A corollary to this is that RST predicts that although some relations may be signalled by conjunctions or connectives of various sorts, the relations will be recognized even if they are unsignalled. Strikingly, most of the relations in the ZPG text are unsignalled. This is strong confirmation of the assumptions of RST: a text is understood to cohere in the ways that it does largely by virtue of its relational structure rather than by virtue of overt markers signalling relations among its parts. In other words, connectives are better thought of as guiding the interpretation of a text than as necessary signals of relations.

Thus there are only eight relational signals in the text. Let's briefly consider each of them. The first is the *when* at the beginning of 7A, marking the relation between 7A and 7B as one of **Circumstance.**

Next is a pair of adverbs that together signal the **Contrast** relation between 9 and 10. As we pointed out in the analysis, 9 gives the initial and stronger reactions, while 10 gives the less immediate and more moderate reactions to the Urban Stress Test news. As signals, we find *At first* at the beginning of 9 and *Now* at the beginning of 10.

The next two explicit signals are signals of concession. The first is *But* at the

beginning of 14. Recall that 11-13 and 14-16 are in a **Concession** relation, which we justified at some length in Section 4 above. The second signal of concession is the *Even though* in 19A, marking 19A as a **Concession** satellite to 19B. This situation nicely illustrates our assumption that relations are perceived to hold between parts of a text largely independently of the signals used. A relation may be unmarked, or, as in this case, it may be marked by one of a variety of signals. A **Concession** relation is typically either marked on the satellite with a "concessive conjunction" such as *although*, or marked instead on the nucleus with a *but*. The claim made in [Thompson & Mann 86], that concession is a matter of discourse relations rather than a matter of a certain type of "subordinate" clause, is supported by the ZPG text.

After the *But* in 14A, there is an infinitive purpose clause, marked with a *to*.

The next relational signal in the text is the *To* in *To make sound choices* in 21A, which signals the **Solutionhood** relation between 21A and 21B. 21A talks about making sound choices and 21B talks about getting the population-stress data to those who make these choices. Thus the satellite 21A presents a problem of decision-making, for which having the data is a (partial) solution. The infinitive *To make sound choices* sets up the problem to which the following main clause presents the solution.

This example provides interesting confirmation of our claim that relations and signals do not correspond in any simple way. Note that in terms of grammatical form, the infinitive clause in 14A (*to use it well*) and that in 21A (*to make sound choices ...*) are identical. Yet the first one accompanies a **Purpose** relation, and the second one accompanies a **Solutionhood** relation. That is, analyzing 21A-21B as in a

Solutionhood relation, rather than as in a **Purpose** relation, is consonant with our perception of the writer's goal to motivate the reader to donate money: it is more plausible that the writer is bringing up the idea of officials making decisions that affect our lives as a problem, which dissemination of the test data can help solve, than that she is claiming that officials and the public need the data for the purpose of making sound choices. Such an argument cannot readily be made for the relation between 14A-B. We will return to 20A-B shortly, as it illustrates another consequence of RST.

Finally, in the P.S., there is a **Means** satellite signalled by *by* in 30B.

Thus, of all the relations in our analysis, as shown in Figure 8, only eight of them are explicitly signalled. Most of the interpretation of the coherence of this text, then, is achieved by inference.

The abundance of unsignalled relations highlights the importance of the differences between text understanding, which involves recognition of text structure and relations, and a symbol decoding task. Recognizing relations requires that the reader make judgments about the writer, including judgments of the plausibility of intentions. Symbolic decoding proceeds on the basis of the conventional import of symbols and their compositions, without judging such factors.

This suggests that much ongoing work that seeks to develop a formal compositional semantics of language will be permanently incomplete with respect to coherent texts.

7.2 "Subordination"

Another consequence of our analysis of the ZPG text in terms of RST is the insight we can gain into the issue of "subordination". As suggested in [Matthiessen & Thompson 89], one kind of what has been studied as grammatical "subordination" is perhaps better viewed as a clause-level and partially grammaticized reflex of nucleus-satellite patterns found pervasively in text.

Following [Halliday 85], Matthiessen and Thompson propose to abandon the term "subordination" and to make a distinction between **hypotaxis** and **embedding**. Hypotaxis includes the category of "subordinate" clauses that are generally thought of as adverbial clauses in English grammar: clauses expressing time, reason, cause, condition, etc. Embedding, on the other hand, includes essentially restrictive relative clauses, subject and object clauses, and clausal complements to verbs and adjectives.

This distinction turns out to have far-reaching consequences as we consider the relationship between "subordination" and text structure, since hypotaxis, but not embedding, seems to play a role at the clause level very similar to that of the relations of RST in text organization in general. In other words, hypotactic clauses seem to be clause-level satellites in the relational structure of the text, no different in function from other satellites encompassing many clauses. To fully support this position is beyond the scope of this paper (for discussion, see [Matthiessen & Thompson 89]); however, in the ZPG text, there are several interesting pieces of support for this view.

First, note that the text contains two **Solutionhood** relations, which happen to be adjacent to each other, the relation between 20-21, and the relation between

21A-21B. We have commented on both of them: the first provided an illustration of relations without signals, while the second provided an illustration of one grammatical form (an infinitive) signalling both a **Purpose** relation (14A-B) and a **Solutionhood** relation (21A-B). Now, in the context of "subordination", we can tie these arguments together to show that the hypotactic clause *To make sound choices...* in 21A is functioning in the relational structure of the ZPG text in precisely the same way as the non-"subordinate" sentence in 20: both are **Solutionhood** satellites to their nuclei.

Second, the text contains a number of examples of embedding. None of these perform text-organizing functions in the same way as do the hypotactic clauses, as just illustrated for the infinitives expressing **Purpose** and **Solutionhood** relations. For example, to continue the discussion in terms of grammatical infinitives, notice that 9 contains the verb phrase *eager to tell the public....* The infinitive in this verb phrase, however, unlike those in 14A and 21A, is not functioning in the text to signal any of the relations of RST (see Appendix); rather it is a grammatical complement to the adjective *eager*, and as such is part of the predicate to which *eager* belongs, which itself is embedded as a truncated relative clause modifying *reporters.*

The same can be said for each instance of embedding in this text. To take just one further example, none of the relative clauses in the text play a role in the relational structure of the text. For instance, 9 contains the relative clause *who were furious that we had "blown the whistle"....* Such a relative clause tells us something about the *public officials* calling the ZPG office, but it does not relate portions of text in the same way that the RST relations do.

In other words, when we consider the function that these embedded clauses have -- such as forming complements to adjectives and verbs, or serving to modify noun phrases -- we find that these types of functions are not needed in the description of relations between larger units.

The RST analysis of the ZPG text, then, supports the general finding that of the two types of "subordination" which have been identified in the literature, only one of them, hypotaxis, can be understood as involving the relations found at higher levels of text organization.

7.3 Concessives

Finally, the RST analysis confirms earlier findings relating to the **Concession** relation.

[Thompson & Mann 86] point out that, although the literature on concession concerns itself largely with the meanings of certain conjunctions such as *although*, concession can be insightfully viewed in terms of discourse relations rather than simply in terms of the meanings of conjunctions. As noted in Sections 4 and 7.1, the two examples of the **Concession** relation in the ZPG text are signalled in different ways: one with an adverbial clause marked with *even though* and one with a main clause marked with *but*. Viewing concession as a meaning of certain types of "subordinate" clause conjunctions would miss the functional similarities between these two situations. So the claim made in [Thompson & Mann 86], that concession is a matter of discourse relations rather than a matter of the meaning of certain conjunctions, is supported by the ZPG text.

8 Status of RST

RST is a step in the process of developing theories of communication. Its strengths include the fact that it provides comprehensive analyses rather than selective commentary, illustrated in its assigning a purpose and status to every unit of the relational elements of the ZPG letter. Because RST is applicable to many kinds of texts, enabling a unified description of text structure regardless of genre, it helps to factor the genuinely genre-specific aspects of text from the more genre-independent ones.

There are several aspects of text description that seem particularly important for communication, but which it does not yet address; we hope that these will be addressed, not necessarily by us, in the near future.

RST has not yet been effectively related to dialogue. It must be expanded beyond written monologue to dialogue and multilogue in order to encompass a fully representative range of the functions of language. This will perhaps be the most significant modification of its present form.

RST also has not yet been related to all of the kinds of theories with which it should interact. Theories of holistic structure and syntactic structure are the most obvious cases; elaboration in both directions would be helpful. In these cases the need can only be partly met by augmentation of RST, since one really needs to connect to theories that are functional in the same effects-oriented sense that RST employs.

In the case of holistic structure, there are function-oriented accounts that suggest that a useful functional reconciliation is possible. Although the relationally-structured

parts of a text are simply parts of a larger whole, they are the parts that justify and motivate the existence of the text. The whole is thus subordinate to the part, and the functions of the nonrelational parts, such as the signature of a letter, promote the effects that organize the relational parts. This functional whole-under-part organization needs investigation.

RST makes no claims about the order of development of parts of a text, nor about how that order might limit the writer's options. Preliminary studies by Cecilia Ford and colleagues of a large number of short texts indicated that neither progressive refinement (top down) nor aggregation of apriori collections (bottom up) was very credible as a simple explanation of how the texts might have been developed. A complex mixed strategy seems called for; more study is needed.

A systematic description of how relations are realized is also needed, one that ranges more widely than any study of conjunctions, covering the various kinds of unsignalled cases as well.

Beyond these, linking RST to theories of text properties such as information flow, thematic structure, and lexical relations would also be worthwhile.

9 Conclusion

We have presented RST as a way to account for the functional potential of text, its capacity to achieve the purposes of speakers and produce effects in hearers. The principal assumptions that RST encodes in its methods have been identified. In the course of accounting for potential effects, we have also shown a way to distinguish coherent texts from incoherent ones, and identified a few of the consequences of text structure.

In presenting our analysis of the ZPG letter we hope that the methods have been made explicit enough so that, by using these and the related techniques found in other publications, you will be able to experiment with RST and improve it.

I. Appendix: Relation Definitions

All of the relations used in the analysis, and a number of others, have been defined in the style described above. In [Mann & Thompson 89], all of the definitions are given, exemplified and discussed. The definition of **Evidence** was discussed at length in Section 3.2 above. In this section we present definitions of the other relations used in the analysis, with only occasional brief discussion. In the definitions, N represents the nucleus and S the satellite. Since for many readers the natural examples have the status of <u>data</u> rather than just exposition, the examples used in [Mann & Thompson 89] and [Mann & Thompson 88] to illustrate the relations are also presented, but without unit division or analysis.

We should note that the relation definitions have the status of applications of the theory rather than elements of the theory. One might want to change or replace the definitions in accounting for other languages, genres, or views of language function than the ones that led to these definitions; such changes are expected and do not cross the definitional boundaries of RST.

The relations are organized as follows:

Motivation, Concession, Background

Circumstance, Solutionhood, Elaboration,
Purpose, Non-volitional Result, Means, Restatement

Sequence, Contrast, Joint

The first group has only the nucleus as its locus of effect, the second group has nucleus + satellite, and the third group is not nucleated.

Motivation

constraints on N: presents an action in which R is the actor (including accepting an offer), unrealized with respect to the context of N

constraints on the N + S combination: Comprehending S increases R's desire to perform action presented in N

the effect: R's desire to perform action presented in N is increased

locus of the effect: N

From a personal message on an electronic bulletin board:

> *Text Example: "The Los Angeles Chamber Ballet (the ballet company I'm dancing with) is giving 4 concerts next week ... Tickets are $7.50 except for the opening night ... The show is made up of new choreography and should be very entertaining. I'm in 3 pieces."*

Several relations involve notions of cause. In broadly defining these relations, it is hard to include both situations that are intended outcomes of some action and causation that does not involve intended outcomes, such as physical causation. Because of this difficulty, we have divided the relations into volitional and a non-volitional groups. Similarly we also divide them on the basis of nuclearity into cause and result groups. Non-Volitional Result, below, is one of the four relations so produced.

Concession

constraints on N: W has positive regard for the situation presented in N;

constraints on S: W is not claiming that the situation presented in S doesn't hold;

constraints on the N + S combination:

W acknowledges a potential or apparent incompatibility between the situations presented in N and S; W regards the situations presented in N and S as compatible; recognizing the compatibility between the situations presented in N and S increases R's positive regard for the situation presented in N

the effect: R's positive regard for the situation presented in N is increased

locus of the effect: N and S

Text Example: "Title: Dioxin

Concern that this material is harmful to health or the environment may be misplaced. Although it is toxic to certain animals, evidence is lacking that it has any serious long-term effect on human beings. "

Text Example: "Although Jim lists tennis, Chinese food, and travel to exotic locales among his favorite hobbies, one can't help but wonder at the unmentioned interests that help spark Jim's creativity, leading him to concoct an unending stream of imaginative programs."

Background

constraints on N: R won't comprehend N sufficiently before reading text of S

constraints on the N + S combination: S increases the ability of R to comprehend an element in N

the effect: R's ability to comprehend N increases

locus of the effect: N

Text Example: "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."

Circumstance

constraints on S: S presents a situation (not unrealized)

constraints on the N + S combination: S sets a framework in the subject matter within which R is intended to interpret the situation presented in N

the effect: R recognizes that the situation presented in S provides the framework for interpreting N

locus of the effect: N and S

Text Example: "Probably the most extreme case of Visitors Fever I have ever witnessed was a few summers ago when I visited relatives in the Midwest."

Text Example: "P. M. has been with KUSC longer than any other staff member. While attending Occidental College, where he majored in philosophy, he volunteered to work at the station as a classical music announcer. That was in 1970."

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Solutionhood

constraints on S: presents a problem

constraints on the N + S combination: the situation presented in N is a (partial) solution to the problem stated in S;

the effect: R recognizes the situation presented in N as a (partial) solution to the problem presented in S

locus of the effect: N and S

Text Example: "One difficulty ... is with sleeping bags in which down and feather fillers are used as insulation. This insulation has a tendency to slip towards the bottom. You can redistribute the filler. ... "

In the definition of the solutionhood relation, the terms problem and solution are broader than one might expect. The scope of problem includes:

1. questions
2. requests, including requests for information
3. some descriptions of desires, goals, intellectual issues, gaps in knowledge or other expressions of needs
4. conditions that carry negative values, either expressly or culturally, including calamities and frustrations.

It thus compares to Grimes' Response predicate [Grimes 75].

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Elaboration

constraints on the N + S combination: S presents additional detail about the situation or some element of subject matter which is presented in N or inferentially accessible in N in one or more of the ways listed below. In the list, if N presents the first member of any pair, then S includes the second:

1. set : member
2. abstract : instance
3. whole : part
4. process : step
5. object : attribute
6. generalization : specific

the effect: R recognizes the situation presented in S as providing additional detail for N. R identifies the element of subject matter for which detail is provided.

locus of the effect: N and S

From a conference announcement brochure:

Text Example: "Sänga-Säby-Kursgård, Sweden, will be the site of the 1969 International Conference on Computational Linguistics, September 1-4. It is expected that some 250 linguists will attend from Asia, West Europe, East Europe including Russia, and the United States. The conference will be concerned with the application of mathematical and computer techniques to the study of natural languages, the development of computer programs as tools for linguistic research, and the application of linguistics to the development of man-machine communication systems."

Purpose

constraints on N: presents an activity

constraints on S: presents a situation that is unrealized

constraints on the N + S combination: S presents a situation to be realized through the activity in N

the effect: R recognizes that the activity in N is initiated in order to realize S

locus of the effect: N and S

Text Example: "To see which Syncom diskette will replace the ones you're using now, send for our free "Flexi-Finder" selection guide and the name of the supplier nearest you."

Text Example: "Presumably, there is a competition among trees in certain forest environments to become as tall as possible so as to catch as much of the sun as possible for photosynthesis."

Non-Volitional Result

constraints on S: presents a situation that is not a volitional action

constraints on the N + S combination: N presents a situation that caused the situation presented in S; presentation of N is more central to W's purposes in putting forth the N-S combination than is the presentation of S.

the effect: R recognizes that the situation presented in N could have caused the situation presented in S

locus of the effect: N and S

Text Example: "The blast, the worst industrial accident in Mexico's history, destroyed the plant and most of the surrounding suburbs. Several thousand people were injured, and about 300 are still in hospital."

Means

constraints on N: presents an action.

constraints on S: none

constraints on the N + S combination: The situation presented in S actually tends to make possible or likely the situation presented in N.

the effect: R recognizes that the situation presented in S actually tends to make possible or likely the situation presented in N.

locus of the effect: N and S

Text Example: "By bouncing sound off rock layers under the sea floor and recording the reflections with many detectors, structural images of the crust can be made at the boundaries where plates collide and rift apart."

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Restatement

constraints on the N + S combination: S restates N, where S and N are of comparable bulk

the effect: R recognizes S as a restatement of N

locus of the effect: N and S

Text Example: "A WELL-GROOMED CAR REFLECTS ITS OWNER

The car you drive says a lot about you."

The last three relations -- **Sequence, Contrast** and **Joint** -- are non-nucleated.

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Sequence

constraints on N: multi-nuclear

constraints on the combination of nuclei: A succession relationship between the situations is presented in the nuclei[13]

the effect: R recognizes the succession relationships among the nuclei.

locus of the effect: multiple nuclei

Text Example: "Peel oranges and slice crosswise. Arrange in a bowl and sprinkle with rum and coconut. Chill until ready to serve."

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[13]Note that the definition does not cover presentational sequence, e.g., "First ... ; Second ..."

Contrast

constraints on N: multi-nuclear

constraints on the combination of nuclei:

no more than two nuclei; the situations presented in these two nuclei are (a) comprehended as the same in many respects (b) comprehended as differing in a few respects and (c) compared with respect to one or more of these differences

the effect: R recognizes the comparability and the difference(s) yielded by the comparison is being made

locus of the effect: multiple nuclei

Text Example: "Animals heal, but trees compartmentalize. They endure a lifetime of injury and infection by setting boundaries that resist the spread of the invading microorganisms. "

Joint

The Joint relation is a notational shorthand for the JOINT schema defined elsewhere. Its "relation definition" does not contain any constraints or specify any effects.

Text Example: "Employees are urged to complete new beneficiary designation forms for retirement or life insurance benefits whenever there is a change in marital or family status.

...

Employees who are not sure of who is listed as their beneficiary should complete new forms since the retirement system and the insurance carrier use the most current form to disburse benefits."

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