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Rhetorical Structure Theory: A Theory of Text Organization

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Rhetorical Structure Theory: A Theory of Text Organization

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Abstract

Rhetorical Structure Theory is a descriptive theory of a major aspect of the organization of natural text. It is a linguistically useful method for describing natural texts, characterizing their structure primarily in terms of relations that hold between parts of the text. This paper establishes a new definitional foundation for RST. Definitions are made more systematic and explicit, they introduce a new functional element, and incidentally reflect more experience in text analysis. Along with the definitions, the paper examines three claims and findings of RST: the predominance of nucleus/satellite structural patterns, the functional basis of hierarchy, and the communicative role of text structure.

1 Introduction

As a descriptive framework for text, Rhetorical Structure Theory provides a combination of features that has turned out to be useful in several kinds of discourse studies. It identifies hierarchic structure in text. It describes the relations between text parts in functional terms, identifying both the transition point of a relation and the extent of the items related. It provides comprehensive analyses rather than selective commentary. It is insensitive to text size, and has been applied to a wide variety of sizes of text.

The definitions in this paper provide a specific and examinable interpretation for an RST structural analysis. They identify the sorts of facts and judgments on which such an analysis is based, and provide most of the framework needed for analyzing new texts.

The purpose of this paper is to make Rhetorical Structure Theory (RST) more explicit and thus more usable and open to examination. In addition to providing definitions, the paper reviews various kinds of consequences of RST and identifies the sense in which it is a functional theory of text structure. Its scope is written monologue; RST has not yet been extended to describe dialogue, multilogue, and spoken language.¹

Several studies have used RST as a descriptive framework for investigating linguistic issues. Successful use of RST in this way validates its assumptions. Some of these studies are described below.

First, RST provides a general way to describe the relations among clauses in a text, whether or not they 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 86], [Thompson & Mann 87] and [Thompson & Mann 86].)

¹We have been developing RST over the last several years at Information Sciences Institute, with valuable input from Cecilia Ford, Barbara Fox, Peter Fries and Christian Matthiessen, in the context of work on text generation, designing computer programs that have some of the capabilities of authors; RST thus has both analytical and constructive uses. In this paper, however, we discuss RST as an analytical tool only. For preliminary discussion of RST and text generation, see [Mann 84] and [Mann & Thompson 86a]. Authorship of this paper is shared equally.

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Second, descriptive RST has been used as an analytical tool for a wide range of text types. [Noel 86], for example, shows how it can be used to characterize news broadcasts. [Fox 84] 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 [Mann & Thompson 86b]). Since the coherence of a text depends in part on these Relational Propositions, RST has been useful in the study of text coherence.

In writing this paper, we presumed of the reader no prior familiarity with RST. The intended audience is linguists, computational linguists and others familiar with common linguistic terminology. Our method is to define the symbolic mechanisms of RST and then present their application along with natural examples. Those most interested in the consequences and content of actual analyses can skip Sections 2 and II and concentrate on the examples in Sections 3 and 6 through 10, since they illustrate the effects of the definitions.

2 Definitions for Relations, Schemas and Structures

This section defines the elements of RST independently of the particular languages and text types to which it has been applied. It defines RST's four kinds of defined objects:

1. Relations
2. Schemas
3. Schema Applications
4. Structures

Briefly, the relation definitions identify particular relationships that can hold between two portions of a text. Based on the relations, the schemas define patterns in which a particular span of text can be analyzed in terms of other spans. The schema

application conventions define the ways that a schema can be instantiated, somewhat more flexibly than just literal part-for-part instantiation. The notion of the structure of an entire text is defined in terms of composition of schema applications.

2.1 Terminology

A *text span* is an uninterrupted linear interval of text. The term *writer* refers to the writer of the text being described; *reader* refers to the intended reader(s) of the text, the audience. W and R denote the writer and reader. The *analyst* is the person who makes judgments about the text to produce the analysis.

2.2 Relations

Relations are defined to hold between two non-overlapping text spans, here called the *nucleus* and the *satellite*,² denoted by N and S.

A relation definition consists of four fields:³

- 1. Constraints on the Nucleus**
- 2. Constraints on the Satellite**
- 3. Constraints on the combination of Nucleus and Satellite**
- 4. The Effect**

Each field specifies particular judgments that the text analyst must make in building the RST structure. Given the nature of text analysis, these are judgments of plausibility rather than certainty. In the case of the Effect field, the analyst is judging whether it is plausible that the writer desires the specified condition.⁴

One goal of this paper is to make it possible to identify the involvements of the analyst's judgment in the analysis. In this view of analysis, the analyst has access to the text, 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. During the analysis, judgments must be made about the

²The terms are simply span labels here; in Section 10 they are described and justified as appropriate labels.

³The locus of the effect is presented as a separate field simply for convenience. It is derived from the Effect field and contains no additional information about the relation.

⁴Plausibility is a threshold concept, based on a degree scale and a conventional way of dividing the scale to provide a binary judgment.

writer or readers. Since such judgments cannot be certain, they must be plausible judgments. In effect, every judgment of the completed analysis is of the form, "It is plausible to the analyst that ..." This is what it means for a proposition to hold as part of an analysis (see also [Crothers 79] for a similar view of the role of plausibility in analysis).

Similarly, all judgments of the reader's comprehension of the text are made on the basis of the text rather than the analyst's direct knowledge of the reader, and thus are from the writer's perspective. These, too, are plausibility judgments.

For example, the statement "Comprehending S and the incompatibility between N and S increases R's positive regard for N" appears in the definition of the Antithesis relation. A more explicit, but equivalent, statement would be: "It is plausible to the analyst that it is plausible to the writer that comprehending S and the incompatibility between N and S would increase R's positive regard for N." Eschewing obfuscatory verbosity of locutional rendering, the circumscriptional appellations are excised.

In judging the functions of text, the analyst sometimes must go beyond literal readings. For example, in analyzing unit 1 of the text presented in Section I.6.2, ("we've been able to mine our own iron ore... all the materials we need"), the analyst must recognize that the unit is not simply about ability to mine ore, but about actual mining.

Note that since every definition has an Effect field, the analyst effectively provides a plausible reason the writer might have had for including each part of the whole text.

This is a more explicit form of definition than that used in previous papers. Though still based on judgments, necessarily, it provides a checklist of affirmations and thus makes it easy to identify the claims underlying a particular analysis.

2.3 Schemas

Schemas define the structural constituency arrangements of text. They are abstract patterns consisting of a small number of constituent text spans, a specification of the relations between them, and a specification of how certain spans (nuclei) are related to the whole collection. They are thus loosely analogous to grammar rules. With the conventions below, they determine the possible RST text structures.

RST is an abstract set of conventions. We can view the conventions as either independent or inclusive of particular relation definitions. The first view is more comprehensive, but the latter is more convenient; we use the latter. (The first view would be essential for a crosslinguistic or crosscultural comparative study in which relation definitions might differ.) This view gives rise to various versions of RST as text

studies proceed. These versions are based primarily on variant sets of relation definitions and secondarily on minor variations in the set of defined schemas.

Schemas, defined in terms of the relations, specify how spans of text can co-occur. With the schema application conditions, they determine the possible RST text structures.

RST recognizes five kinds of schemas, represented by the five examples diagrammed in Figure 1. The curves represent relations holding, and the straight lines represent identification of the nuclear span(s). Schemas for relations not mentioned in the figure all follow the simple pattern represented by Circumstance: a single relation with nucleus and satellite. The schema names for these are the same as the corresponding relation names. The large majority of both schemas and schema applications follow this simple pattern; it is possible to analyze dozens of ordinary texts and encounter nothing else.

The multinuclear schemas are used to represent portions of text, a minority, in which another pattern of organization is used instead of organization around a single nucleus. The CONTRAST schema always has exactly two nuclei. SEQUENCE has indefinitely many, one for each sequence element, and a succession relation between adjacent nuclei. JOINT also has indefinitely many nuclei. Of course, these are nuclei by convention only, since there are no corresponding satellites.

2.4 Schema Applications

Schemas that appear in text structures are not always exact copies of the schemas as defined; some variations are permitted. Three conventions determine the possible applications of a schema.

1. **unordered spans:** The schemas do not constrain the order of nucleus or satellites in the text span in which the schema is applied.
2. **optional relations:** For multi-relation schemas, all individual relations are optional, but at least one of the relations must hold.
3. **repeated relations:** A relation that is part of a schema can be applied any number of times in the application of that schema.

2.5 Structural Analyses and Structure Diagrams

The first step in analyzing a text is dividing it into units. Unit size is arbitrary, but the division of the text into units should be based on some theory-neutral classification. That is, for interesting results, the units should have independent functional integrity. In our analyses, units are essentially clauses, except that clausal subjects and complements and restrictive relative clauses are considered parts of their host clause units rather than separate units.

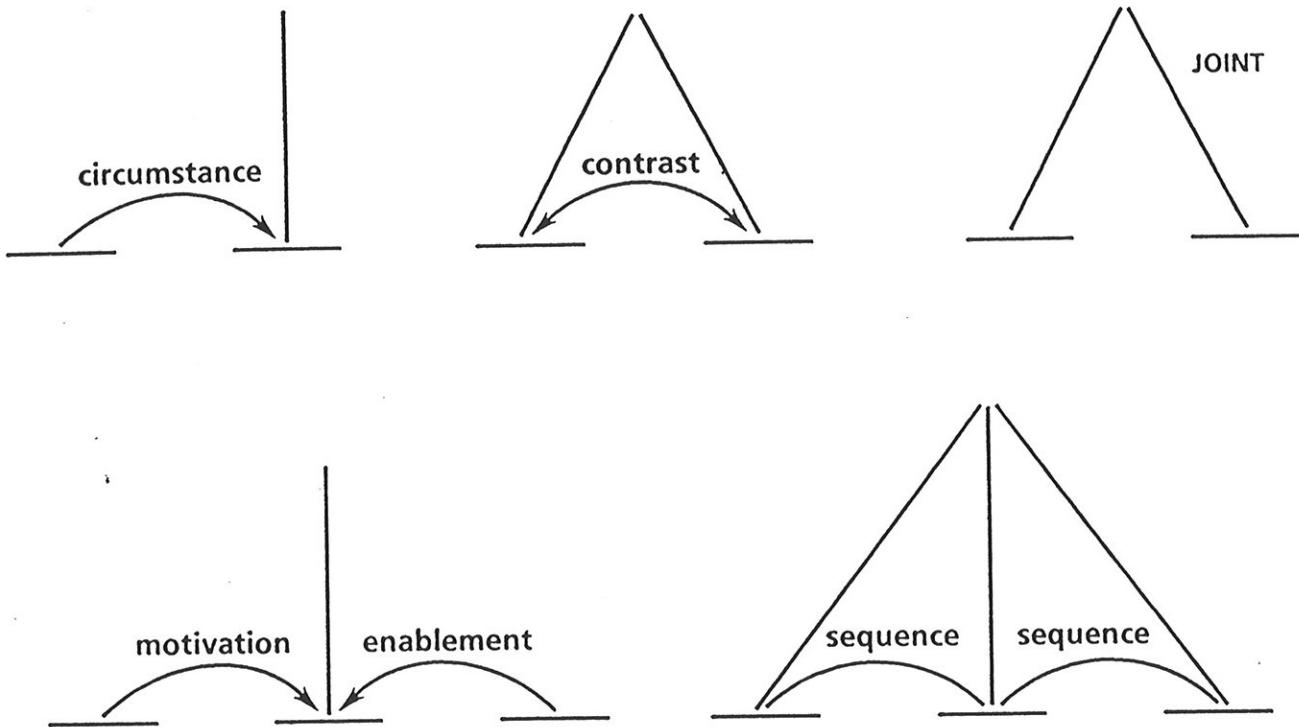


Figure 1: Examples of the Five Schema Types

A structural analysis of a text is a set of schema applications such that the following constraints hold:

completeness: The set contains one schema application that contains a set of text spans that constitute the entire text.

connectedness: Except for the entire text as a text span, each text span in the analysis is either a minimal unit or a constituent of another schema application of the analysis.

uniqueness: Each schema application consists of a different set of text spans, and within a multi-relation schema each relation applies to a different set of text spans.

adjacency: The text spans of each schema application constitute one text span.

Note that completeness, connectedness and uniqueness taken together are sufficient to cause RST analyses to be trees.

The definitions in this section are sufficient to give a definite interpretation to the notion that a certain structure is an RST structural analysis of a certain text.

Diagrams representing the RST structures of texts are found throughout this paper. In these, the arcs, labeled with relation names, connect portions of a structure for which the relation holds. Each vertical line descends from the text span being decomposed by a schema application down to the nucleus of the schema application. Numbers represent the sequence of undecomposed units of the structure.

A very few texts, typically advertisements in which a title line plays a role in the body of the text, can be analyzed only if the adjacency constraint is relaxed. Other texts are best analyzed if the uniqueness constraint is relaxed; this approach helps account for parallelism and for spans in which more than one relation holds for a pair of spans. For some texts, more than one analysis may be appropriate, as described in Section 9.

3 Relations and Relation Definitions

This section introduces all of our defined relations by name, and presents a representative sample of definitions; the remaining definitions are in Appendix I. A major goal of this paper is to convey the definitions of these relations.⁵

Table 1 shows the defined relations, grouped according to a specific kind of resemblance. Each group consists of relations that share a number of characteristics and differ in one or two particular attributes.

⁵There are no doubt other relations which might be reasonable constructs in a theory of text structure; on our list are those which have proven most useful for the analysis of the data we have examined. A number of the relations in this paper are also discussed and illustrated, with some differences, in [Noel 86].

Table 1: Organization of the Relation Definitions

Circumstance	Antithesis and Concession
Solutionhood	Antithesis
Elaboration	Concession
Background	Condition and Otherwise
Enablement and Motivation	Condition
Enablement	Otherwise
Motivation	Interpretation and Evaluation
Evidence and Justify	Interpretation
Evidence	Evaluation
Justify	Restatement and Summary
Relations of Cause	Restatement
Volitional Cause	Summary
Non-Volitional Cause	Other Relations
Volitional Result	Sequence
Non-Volitional Result	Contrast
Purpose	

In the relation definition sections, here and in the appendix, each relation definition is accompanied by the analysis of a natural example of its occurrence. Many of these are analyses of whole texts or substantial extracts, going beyond illustrating the single relation being defined.

The four relation definitions below comprise two of the groups from Table 1. They illustrate a diverse range of textual effects, which one can identify, depending on one's technical orientation, as interpersonal or social effects, ideational or argumentation effects and textual or presentational effects.

3.1 Evidence and Justify

Evidence and **Justify** form a subgroup; both involve the reader's attitude toward the nucleus. An **Evidence** satellite is intended to increase the reader's belief in the nuclear material; a **Justify** satellite is intended to increase the reader's readiness to accept the writer's right to present the nuclear material.

3.1.1 Evidence

relation name: EVIDENCE

constraints on N: R might not believe N to a degree satisfactory to W⁶

constraints on S: The reader believes S or will find it credible.

constraints on the N + S combination:

R's comprehending S increases R's belief of N

the effect: R's belief of N is increased

locus of the effect: N

This extract from a letter to the editor of BYTE magazine has an example of the Evidence relation. The writer is praising a federal income tax program published in a previous issue:

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 return and got a result which agreed with my hand calculations to the penny.

The RST diagram in Figure 2 shows units 2 - 3 in an Evidence relation with unit 1; they are provided to increase the reader's belief in the claim expressed in unit 1.

3.1.2 Justify

The following short text, from the electronic bulletin board at ISI, provides an example of the Justify relation:

1. The next music day is scheduled for July 21 (Saturday), noon-midnight.
2. I'll post more details later,
3. but this is a good time to reserve the place on your calendar.

In this text, units 2 - 3 are in a Justify relation with unit 1. They tell readers why the writer believes he has the right to say unit 1 without giving "more details," in particular without giving the location of the music day event. These relations are diagrammed in Figure 3.

For another example of Justify, an analysis of a text containing "Let's be clear,"

⁶In RST, belief is treated as a degree concept. This is not a central feature of the definitions, but it helps explain certain text features, e.g., multiple lines of evidence. All judgments of the reader's states and reactions necessarily stem from the analyst's view of the writer's view, since they are based on the text.

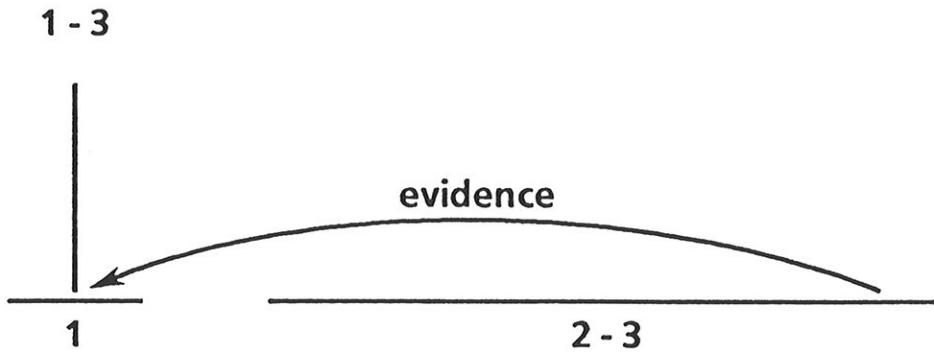


Figure 2: RST diagram for "Tax Program" text

relation name: JUSTIFY

constraints on N: none

constraints on S: none

constraints on the N + S combination:

R's comprehending S increases R's readiness to accept W'S right to present N

the effect: R's readiness to accept W's right to present N is increased

locus of the effect: N

see the Common Cause text analyzed in detail in [Mann & Thompson 86b], [Mann & Thompson 85], and [Thompson & Mann 87].

3.2 Antithesis and Concession

These two relations in the Antithesis/Concession subgroup share the following property: The desired effect is to cause the reader to have positive regard for the nucleus. They differ in that **Antithesis** is a subtype of **Contrast**, as reflected in the definition, while **Concession** is not.

3.2.1 Antithesis

The contrast in positive regard, which is at the core of the **Antithesis** relation, is well illustrated by the first paragraph from an editorial in *The Hartford Courant*:

1 - 3

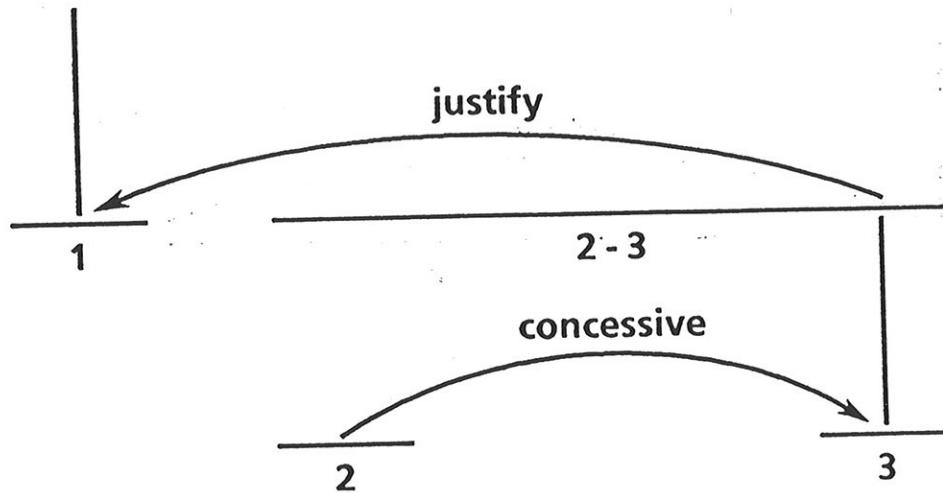


Figure 3: RST diagram of "Music Day" text

relation name: ANTITHESIS

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

constraints on S: none

constraints on the N + S combination:

the situations presented in N and S are in contrast (cf. CONTRAST, i.e., are (a) comprehended as the same in many respects (b) comprehended as differing in a few respects and (c) are compared with respect to one or more of these differences); because of an incompatibility that arises from the contrast, one cannot have positive regard for both the situations presented in N and S; comprehending S and the incompatibility 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 N is increased

locus of the effect: N

1. Farmington police had to help control traffic recently
2. when hundreds of people lined up to be among the first applying for jobs at the yet-to-open Marriott Hotel.
3. The hotel's help-wanted announcement - for 300 openings - was a rare opportunity for many unemployed.
4. The people waiting in line carried a message, a refutation, of claims that the jobless could be employed if only they showed enough moxie.
5. Every rule has exceptions,
6. but the tragic and too-common tableaux of hundreds or even thousands of people snake-lining up for any task with a paycheck illustrates a lack of jobs,
7. not laziness.

Figure 4 gives the RST diagram for this excerpt.

Units 6 - 7 in this excerpt illustrate the **Antithesis** relation. In unit 7, the editorial writer considers the thesis that unemployment can be explained in terms of laziness, but she clearly favors (i.e., has positive regard for) the proposition in unit 6: Unemployment has its roots in a lack of jobs.

3.2.2 Concession

One obvious way to signal a **Concession** relation is an *although* clause (but see [Thompson & Mann 86] for discussion of the form-function relationship with **Concession**). Here is a clear example in a *Scientific American* abstract:

Title: Dioxin⁷

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

⁷We are not considering the title to be a unit of analysis; it is included to provide the antecedent for the pronominal demonstrative *this* in unit 1.

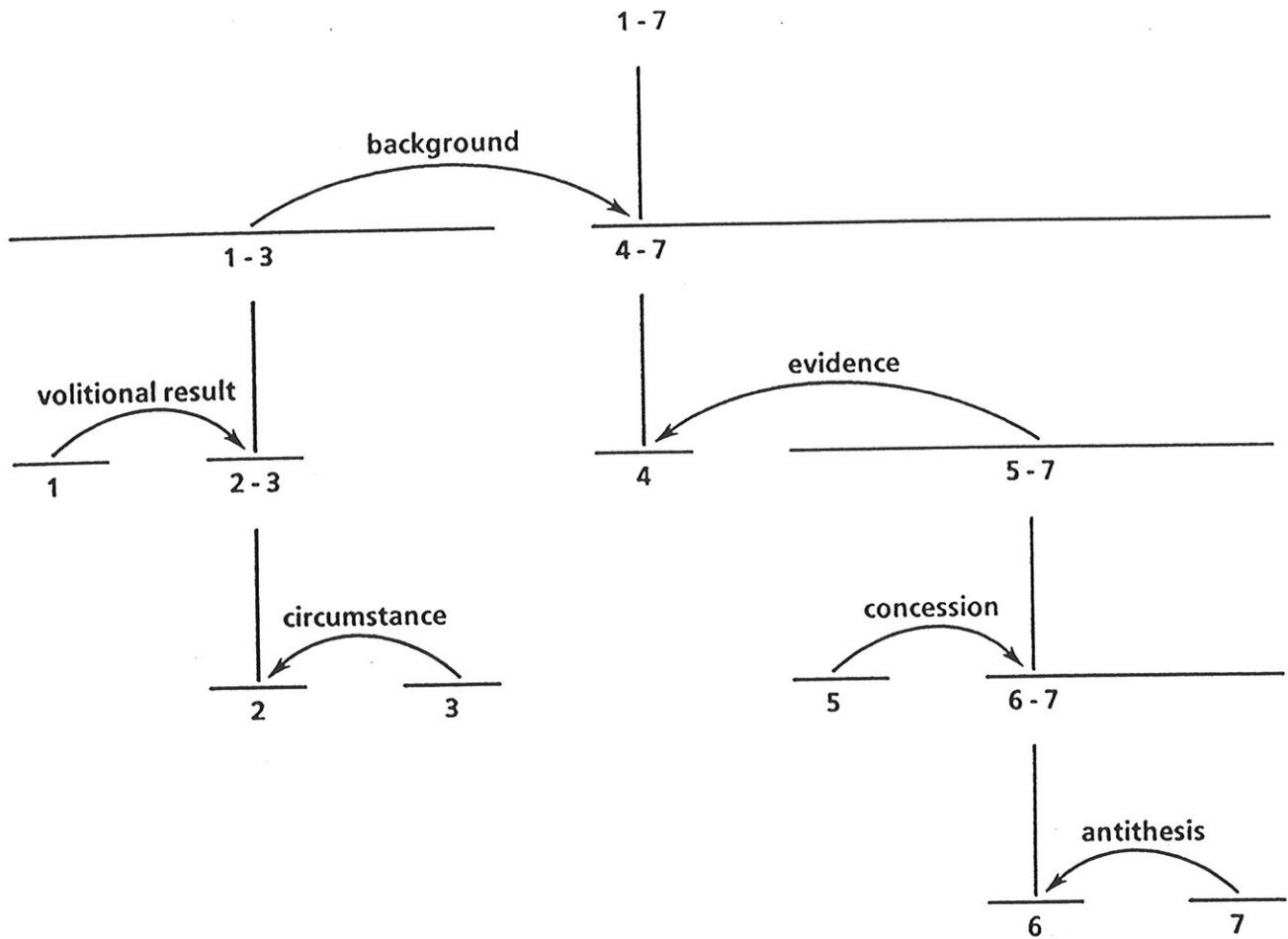


Figure 4: RST diagram for "Not Laziness" text

In this text, the writer both signals that units 2 and 3 are compatible and acknowledges their potential incompatibility. That is, dioxin's toxicity to certain animals is compatible with the lack of evidence that it is harmful to humans, but it is also potentially incompatible with it, since toxicity to animals often implies toxicity to humans. Figure 5 gives the RST diagram for this text.

Concession need not be signalled with a hypotactic *although* clause. As is well-known, it can appear in other forms, one common one being parataxis signalled by *but*. Here is an example from a 19-unit description of one of the announcers on a Los Angeles public radio station:

relation name: 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

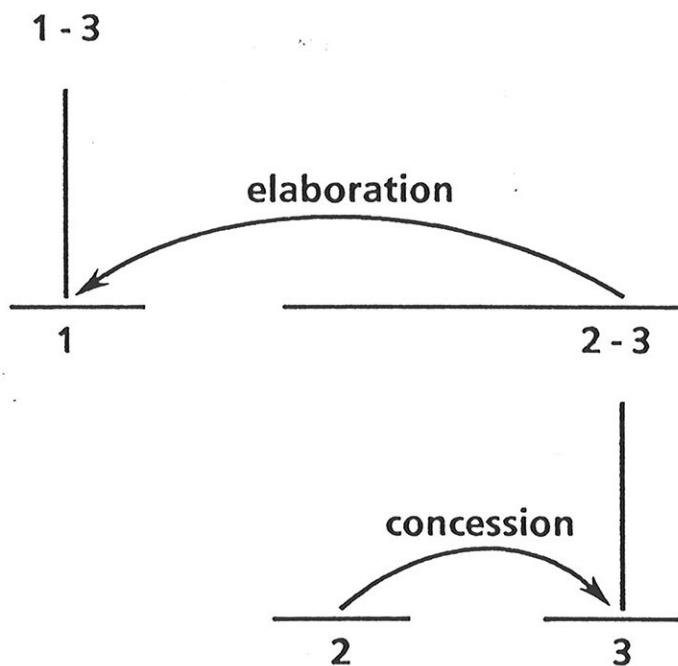


Figure 5: RST diagram for "Dioxin" text

17. Although Jim lists tennis, Chinese food, and travel to exotic locales among his favorite hobbies,

18. 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.

In this extract, unit 17, in which the three hobbies are mentioned, is potentially incompatible with unit 18, which allude to unmentioned interests. Because of the *unmentioned*, however, the writer views the content of these two units as compatible, and hopes that the reader, by recognizing this compatibility, will view the content of unit 18 with positive regard. That is, the reader is less likely to object to unit 18 by saying "but Jim only has three hobbies." The RST diagram for this text is given in Figure 6.

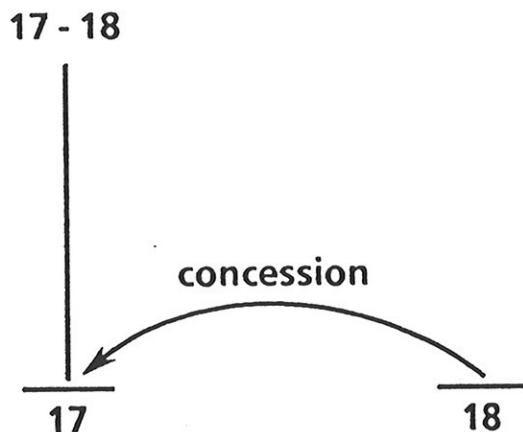


Figure 6: RST diagram for "Hobbies" text

Definitions of the other relations are given in Appendix I. The sections below give a more comprehensive view of RST analyses and their interpretation.

4 Order of Spans

As indicated above, the relation and schema definitions do not constrain the order of spans in the text. Ordering seems to be under the independent control of the writer.

Despite this independence, some strong patterns of ordering particular relations have become evident in the text analysis done so far. We present them here as strong tendencies rather than constraints. Table 2 presents the canonical, unmarked, most frequent order of spans for many of the relations. The rest might have no canonical order.

We have observed that if a natural text is rewritten to convert the instances of non-canonical span order to canonical order, it seldom reduces text quality and often

improves it. The opposite is true of converting canonical order to non-canonical, e.g., by putting a background satellite at the end.

Table 2: Canonical Orders of Spans for Some Relations

Satellite Before Nucleus

Antithesis	Conditional
Background	Justify
Concessive	Solutionhood

Nucleus Before Satellite

Elaboration	Purpose
Enablement	Restatement
Evidence	

5 Distinctions Among Relations

Several people have suggested that we create a taxonomy of the relations in order to present the important differences among them. However, no single taxonomy seems suitable. Depending on one's interests, any of several features and dimensions of the relations could be made the basis for grouping them. The grouping of relations reflected in Table 1, in Section 3, reflects one such basis. Other bases could be time, writer and reader participation, and locus of effect.

An interesting two-way division is one based on a distinction between what we might call "subject matter" and "presentational" aspects of text structure. Thus, relations, such as **Volitional Cause**, express parts of the subject matter of the text. **Volitional Cause** relates two text spans if they are understood as causally related in the subject matter. Others, such as **Justify**, are used only to facilitate the presentation process itself. **Justify** relates two text spans only if one of them is deemed likely to increase the reader's acceptance of the other.

The following chart suggests possible names for this distinction, in addition to the labels Subject Matter/Presentational:

Subject Matter	Presentational
Semantic	Pragmatic (see [van Dijk 77:208] and [Ford 87])
Ideational	

We can, then, divide the relations we have presented into these two groups. What determines the proper group for a given relation? The clearest indicator is the

effect a relation has on the reader, as given in the definition for each relation. Subject matter relations are those whose intended effect is that the reader recognize the relation in question; presentational relations are those whose intended effect is to increase some inclination in the reader, such as the desire to act or degree of the positive regard for, belief in, or acceptance of the nucleus. Table 3 presents this classification.⁸

Table 3: Relation Classification on Subject Matter / Presentational Basis

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

Clearly, RST relations can be taxonomized in other ways. We could distinguish those with locus of effect in the nucleus from those with locus of effect in the nucleus and the satellite. Or we could distinguish those that involve reader action from those that do not. These distinctions could be useful in ways we will not pursue here; the distinction of subject matter and presentational appears, to us, laden with implications for text interpretation.

6 Effects and Functionalism

An essential part of a relation definition is the section labeled Effect. It contains a statement of some condition that is routinely achieved through use of the relation. When the analyst applies the definitions and creates a particular RST description of a text, the Effect serves as a constraint against inappropriate use of relations.

⁸We note that this distinction is reminiscent of, but not the same as, Halliday and Hasan's distinction between "external" and "internal" relations ([Halliday & Hasan 76], [Martin 83] and [Noel 86]).

This leads to the following observation about RST structural descriptions of texts:

For each relation and schema definition, the definition applies only if it is plausible to the analyst that the writer wanted to use the spanned portion of the text to achieve the Effect.

As a result, an RST analysis always constitutes a plausible account of what the writer wanted to achieve with each part of the text. An RST analysis is thus a functional account of the text as a whole.⁹

This point is important in establishing just how our approach offers a functional account of text structure. RST provides an explicit plausible functional account of a text as a side effect of the analysis, precisely because the definitions are stated in terms of how the text produces an effect on the reader which the writer could reasonably have intended. In applying a relation definition, the analyst affirms the plausibility of each Effect.

The applicability of a relation definition never depends directly on the form of the text being analyzed; the definitions do not cite conjunctions, tense, or particular words. RST structures are, therefore, structures of functions rather than structures of forms.

7 Use and Consequences of RST

To this point, the paper has been devoted to defining and exemplifying the conventions, methods and mechanisms of RST. It has not presented research results, except as they represent a point in a development sequence, a sequence of successively more defensible conventions found increasingly useful in empirical descriptive work on natural texts.

Although the primary purpose of the paper is definitional, we can review some results of applying RST constructs to natural texts. But first, we should note that the definitional sections do not imply that texts will have RST structures. One could imagine that no texts with such structures exist; the fact that some texts have RST structures is thus a result.

Two groups of results are reviewed below, one from text analyses and the other from studies of relational properties.

⁹Of course, it is not the whole functional account; many effects of a text do not depend on its RST structure.

7.1 Results from Text Analysis

At this writing, hundreds of texts, representing thousands of clauses or units, have been analyzed using RST. They represent a wide variety of text types: administrative memos, magazine articles, advertisements, personal letters, political essays, scientific abstracts and more. Briefly, the outcomes of these analyses are:

1. Virtually every text has an RST analysis.
2. Certain text types characteristically do not have RST analyses. These include laws, contracts, reports "for the record" and various kinds of language-as-art, including some poetry.
3. In our culture, texts that have RST analyses predominate. It is thus typical, but not universal, for texts to be hierarchically structured and functionally organized.

7.2 Results from Studies of Relational Properties

While studying text relations and developing RST, we became aware that the presence of structural relations in a text has consequences that closely resemble the consequences of clausal assertion. The text structure conveys propositions, and propositions conveyed in this way are called *relational propositions*. We have explained and documented the phenomenon in other papers [Mann & Thompson 86b], [Mann & Thompson 85].

These relational assertions have several unusual properties:

1. They are not clausally expressed.
2. Although conjunctions or other morphemes, sometimes signal the presence of such propositions, they can be conveyed with no formal signal at all.
3. The relational propositions correspond to the relations of the RST structure of the text. One relational proposition arises from each relation of the structure.
4. The relational propositions are essential to the coherence of their texts. Perturbing text to prevent the (implicit or explicit) expression of one of its relational propositions causes the text to become incoherent.

Recognizing the relations of a text, which is tantamount to recognizing its RST structure and the basis of its coherence, is thus essential to understanding the text.

For a given relation, one can identify a corresponding assertional form. In reading natural texts, people consistently judge that the text conveys the relational

propositions, even in cases where no morphosyntactic signal of the relation exists (as in Figures I-4 and 2.)

Take, for example, the text 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 return
3. and got a result which agreed with my hand calculations to the penny.

People commonly recognize that the text conveys the idea that a result that agrees with hand calculations is evidence that the program works. The writer's use of the **Evidence** relation thus has the effect of asserting that one thing is evidence for another, a suitable basis for increasing the reader's belief.

The other relations, likewise, convey relational propositions, each representative of the relation definition. Relational propositions represent a new class of assertional effects. They are not invited inferences, Gricean implicatures or mere opportunistic inferences from available knowledge, all of which are quite avoidable. Relational propositions are as inevitable as text structure itself.

We find all the relational propositions essential to the coherence of the text. If they can somehow be neutralized, as by explicit contrary assertions, the coherence of the text is broken at the point of the missing relation; it becomes incoherent or takes on some alternate interpretation.

Since the relations need no signal in the text, neither do the relational propositions. Relational propositions are not compositional in the usual sense -- the communication effect arises from something other than the composition of interpretations of explicit parts. And they are about as numerous as independent clauses.

Relational propositions, therefore, challenge theories of language that equate the communication effect of a text with the "meanings" of its sentences and compose those meanings from the meanings of its syntactic structures and lexical items.

All of these aspects of relational propositions have been recognized in prior work. The new element in this paper is that relational propositions are seen as derived directly from the relation definition itself. In particular, the Effect field appears to be a sufficient basis for derivation of the relational proposition.

While the details need to be worked out, it seems clear that the relational

proposition need not be specified as a stipulated effect of the relation. Instead, it is linked directly to the writer's intent.

8 Analysis of a Larger Text

Thus far, our example texts illustrating RST relations have been relatively short. In this section we will apply RST to the analysis of a larger text. In an earlier paper, we have analyzed this text in terms of relational propositions [Mann & Thompson 86b], and also discussed it in [Thompson & Mann 87]. It is an advertisement for computer diskettes from BYTE magazine.¹⁰

¹⁰From an advertisement by Syncrom appearing in the June, 1982 issue of BYTE magazine. Copyright © 1982 Byte Publications, Inc. Used with permission of BYTE Publications, Inc.

1. What if you're having to clean floppy drive heads too often?
 2. Ask for SYNCOM diskettes, with burnished Ectype coating and dust-absorbing jacket liners.
 3. As your floppy drive writes or reads,
 4. a Syncrom diskette is working four ways
 5. to keep loose particles and dust from causing soft errors, dropouts.
 6. Cleaning agents on the burnished surface of the Ectype coating actually remove build-up from the head,
 7. while lubricating it at the same time.
 8. A carbon additive drains away static electricity
 9. before it can attract dust or lint.
 10. Strong binders hold the signal-carrying oxides tightly within the coating.
- 11A. And the non-woven jacket liner,
 12. more than just wiping the surface,
- 11B. provides thousands of tiny pockets to keep what it collects.¹¹
 13. To see which Syncrom diskette will replace the ones you're using now,
 14. send for our free "Flexi-Finder" selection guide and the name of the supplier nearest you.
 15. Syncrom, Box 130, Mitchell, SD 57301. 800-843-9862; 605-996-8200.

The RST analysis of this text appears in Figure 7. We will not discuss each part

¹¹Our analysis of this infinitival clause as part of unit 11, rather than as a separate unit, derives from the judgment that *to keep what it collects* is an infinitival relative clause on the head noun *pockets*, rather than a purpose clause for the predicate *provides thousands of tiny pockets*; the pockets are intended to keep what the liner collects, not the liner itself. The alternative analysis, however, would not change our overall point.

of the analysis in detail, but will outline its central claims for the overall structure of the text.

Figure 7 shows that the Syncom text is organized in terms of a **Solutionhood** relation: Unit 1 (*What if you're having to clean floppy drive heads too often?*) presents a problem, which the rest of the text solves. The next finer level grossly analyzes this solution, by means of the MOTIVATION/ENABLEMENT Schema, as a nuclear imperative (*Ask for Syncom diskettes ...*) with two satellites, one for the **Motivation** relation (units 3 - 12) and one for the **Enablement** relation (units 13 - 15).

The next finer level of analysis involves each of these two satellites. The **Motivation** satellite is realized as an ELABORATION Schema, where the nucleus names *four ways* that dust and loose particles can cause mischief and four **Elaboration** satellites detail the *four ways*.

By referring to Figure 7, we can continue our outline of the rhetorical analysis of this text.

The nucleus of this ELABORATION Schema, units 3 - 5, consists of a CIRCUMSTANCE Schema, where unit 3 provides the circumstances under which your Syncom diskette *works four ways*. At the terminal level of this CIRCUMSTANCE Schema, we find a PURPOSE Schema, where the Purpose satellite, unit 5, gives the purpose for which the Syncom diskette was designed to *work four ways*.

Moving back up to the **Elaboration** satellites, units 6 - 12, we see that units 6 - 7, 8 - 9, 10, and 11 - 12 each list one of the *four ways* the Syncom diskette works. Three of these four satellites are themselves complex.

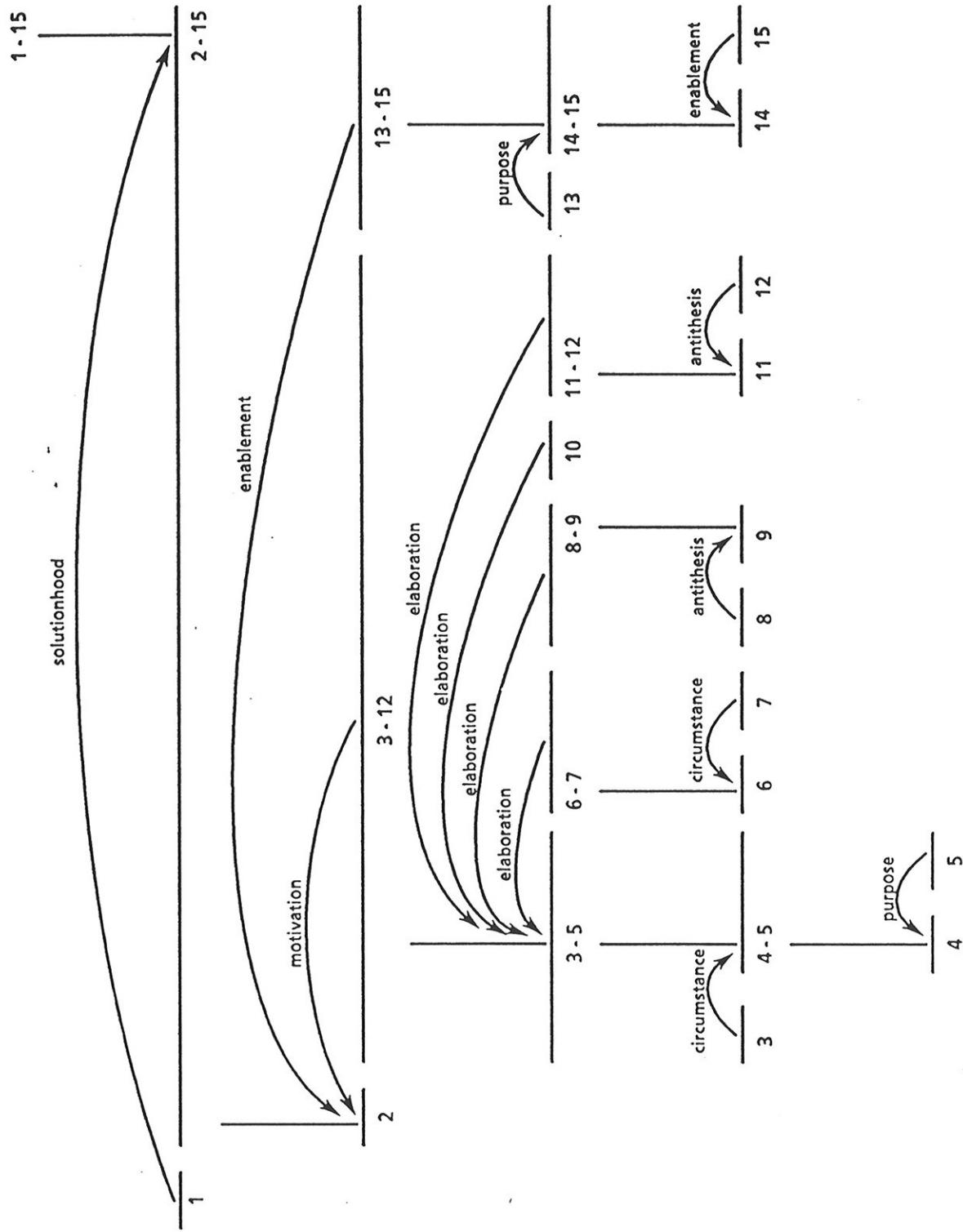
Examining these complex satellites one at a time, we see first that a CIRCUMSTANCE Schema represents units 6 and 7 (about the *cleaning agents removing build-up while lubricating*). Next, we see that both units 8 - 9 and units 11 - 12 are in an **Antithesis** relation.

In the first pair, unit 9 presents the "thesis" satellite, the idea that static electricity attracts dust and dirt. By the use of *before*, the writer signals a lack of positive regard for this idea in favor of the nuclear "antithesis," unit 8, which claims that the static electricity is drained away.

Again in the second pair, the "antithesis" nucleus follows the "thesis" satellite. This time, the writer contrasts the thesis -- the idea that the jacket liner *just* wipes the surface -- with the positively regarded antithesis -- the idea that this jacket liner *provides thousands of tiny pockets to hold what it collects*.

This discussion makes it clear that the bulk of this text, namely units 3 - 12 (10

Figure 7: RST diagram for "Syncrom" text



out of the 15 units making up this text), is devoted to motivating the reader to buy the Syncom diskettes. RST's way of stating such generalizations about the structure of ordinary texts is one measure of its usefulness as an analytical tool.

The **Enablement** satellite represents the final text span, units 13 - 15. Again, the ad writer has opted for a **Solutionhood** relation; unit 13 poses the "problem" (really a pseudo-problem, with a number of blatantly unwarranted assumptions) of how to determine *which Syncom diskette will replace the ones you're using now*. The "solution," of course, is to send for the free "Flexi-Finder" selection guide and name of nearest dealer. Unit 15 provides information needed to enable this action.

What are we as analysts saying by means of this analysis about the effects intended by the writer? Figure 8 shows Effects statements that correspond to a portion of the top three levels of the structure in Figure 7.

9 Multiple Analyses in RST

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. This section explores the sources and significance of multiple analyses.

9.1 Varieties of Differences between Analyses

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 kinds of multiplicity:

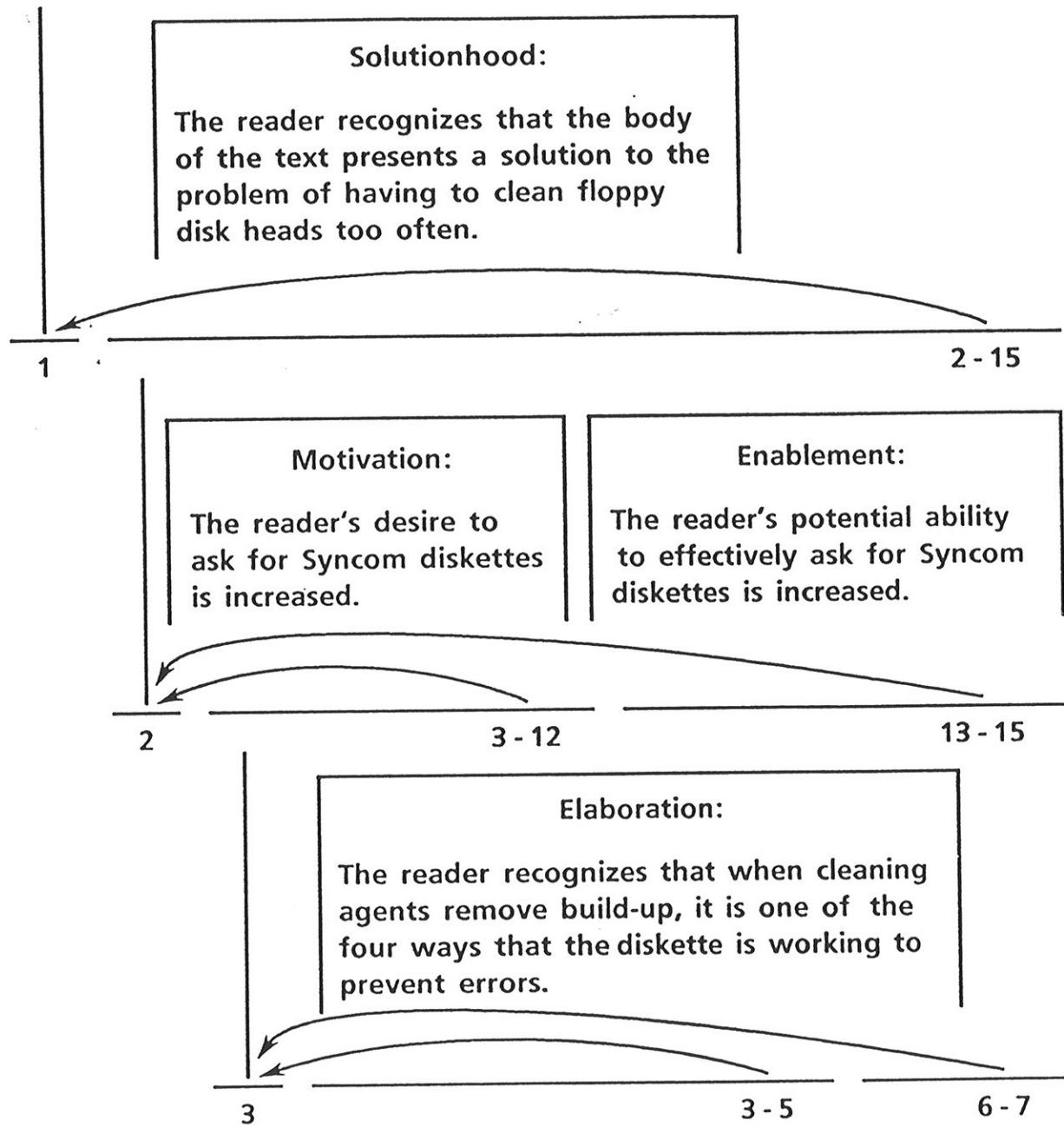
1. Boundary Judgments
2. Text Structure Ambiguity
3. Simultaneous Analyses
4. Differences Between Analysts
5. Analytical Error

9.1.1 Boundary Judgments

Linguistic theories, including RST, force the analyst to make category judgments about the phenomena encountered. All such category judgments encounter borderline cases which must be forced into the categories of the theory. The problem seems inherent for theories that make use of the notion of categories.

However, our experience does not suggest that this is a major source of multiplicity of RST analyses.

Figure 8: Some Effects Statements for the Syncrom Advertisement



9.1.2 Text Structure Ambiguity

Even given well bounded categories, realistic linguistic theories admit alternative analyses of their phenomena at all levels. Ambiguity is normal in grammatical structure, and is commonly encountered on such tasks as syllable boundary determination, decisions on whether a set of words represents a single lexical item, determination of the correspondence of phonological segmentation to grammatical segmentation, identification of word sense, determination of quantifier scope, determination of scope of negation, identification of indirect speech acts and resolution of anaphora.

Ambiguity is also normal in RST. Nothing in the definitions of RST constrains it to single analyses. To do so would be unrealistic and quite unexpected given the countercurrent of experience in linguistics. When an analyst finds ambiguity, it is a recognition that any of several incompatible analyses are plausible, and that the text does not provide a sufficient basis to disallow any of them. This differs from simultaneous analyses, described below.

9.1.3 Simultaneous Analyses

Sometimes there is a pair of spans in a text for which the analyst recognizes that more than one relation definition holds, i.e., the analyst affirms the defining conditions of more than one relation. We call this **overlap**. It has been discussed in [Ford 87]. The key difference between ambiguity and simultaneous analyses is in the compatibility of the alternate analyses.

To illustrate simultaneous analyses, consider the following text which is presented with the definition of the Otherwise relation in Section I.7:

1. It's new brochure time,
2. and that means a chance for new project write-ups.
- 3A. Anyone
4. desiring to update their entry in this brochure
- 3B. should have their copy in by Dec. 1.
5. Otherwise the existing entry will be used.

Figure 9 shows the top of an RST analysis of this text. The uppermost relation, between units 1 - 2 and units 3 - 5, is shown as **Background** but could also be shown as **Justify**. **Background** fits, since units 1 - 2 make the remaining units

comprehensible. But in presenting the "opportunity" for new writeups they also make acceptable the request for copy, the deadline and the gentle warning at the end. It is quite plausible that the writer wanted to justify the request and also make it comprehensible. It happens that these two dissimilar relations both hold, and so they exemplify simultaneity rather than ambiguity.

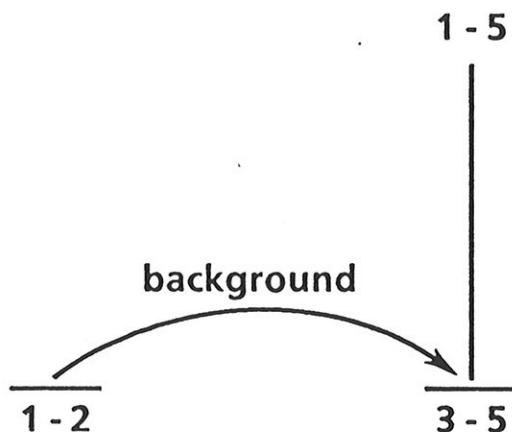


Figure 9: Top of an RST diagram for "Update" Text

Differences in identification of relations are the most frequent type of simultaneity. Cases of simultaneous analyses with different structures also occur. In one such case, a letter to supervisors and employees, a single text had two analyses, one for each segment of the audience.

9.1.4 Differences Between Analysts

An analysis always involves three elements: the text, the structure and the analyst. An analysis is a statement that a particular analyst finds a certain collection of propositions plausible. Differences between analysts, based on genuine differences in their reactions to the text, are to be expected. Such differences occur, but we find them infrequent. More often we find that when two analysts' analyses differ, each will accept the structures that the other posits, and so they will come to agree that a particular ambiguity exists.

9.1.5 Analytical Error

RST analysis stabilizes with practice. Errors are frequent, especially at first, and we find that an apparently divergent collection of analyses often collapses to a consensus when the differences are examined. It also appears that the definitional basis for RST made explicit in this paper makes that convergence somewhat more likely than it had been.

9.2 Ambiguity, Disagreement and Preferred Analyses

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.

Even for a single analyst, when several analyses are acceptable there are preferred and marginal analyses. These reactions are analogous to people's reactions to grammatical analyses. However, unlike the case for grammatical analyses, RST provides a way to reject certain sorts of analyses that technically conform to definitional criteria but seem unrelated to the actual use of the language in context. Because each relation definition has an Effect field, the analyst must affirm that the writer plausibly intended the given effect; otherwise the analysis is rejected. This restricts RST analyses to genuinely plausible descriptions.

Imagine, for example, that a satellite provides evidence for a particular proposition expressed in its nucleus, and happens to do so by citing an attribute of some element expressed in the nucleus. Then, aside from the Effect conditions, the conditions for both Evidence and Elaboration are fulfilled. If the analyst sees the writer's intent as increasing the reader's belief of the nuclear propositions, and not as getting the reader to recognize the object:attribute relationship, then the only analysis is the one with the Evidence relation. This sort of discrimination gives RST a kind of selectivity that form-based methods of analysis cannot have, at the cost of having the analyst involved in an explicit way in the analysis.

Thus we see that 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.

10 Nuclearity

10.1 What is nuclearity?

In the early development of RST, we noticed that texts could generally be described by breaking them down into pairs of spans; the various kinds of regular relationships between the members of the pair became the relations.

At the same time, we noted that the relations were mostly asymmetric. If A is evidence for B, then B is not evidence for A. In addition, there were regularities across relations in the way that the spans functioned for the text as a whole. In particular, if the asymmetries of the relations were arranged in a particular way, in effect into two "columns," each column had commonalities among the elements. We elaborated on these commonalities and formed them into our concepts of nucleus and satellite.

Three commonalities are noticeable.

1. Often, one member of the pair is incomprehensible independent of the other, a non-sequitur, but not vice versa. Without the nuclear claim, the evidence satellite is a non-sequitur, as is the background satellite without the nuclear span it illuminates.
2. Often, one member of the pair is more suitable for substitution than the other. An Evidence satellite can be replaced by entirely different evidence without much change to the apparent function of the text as a whole; replacement of a claim is much more drastic.
3. Often, one member of the pair is more essential to the writer's purpose than the other.¹²

These asymmetries form a single pattern which is represented in the relations definitions by the assignment of the nucleus and satellite labels. In analyzing a text the identification of nuclei is thus generally a byproduct of recognition that a particular relation holds. (The only exceptions are in the cause cluster.)

10.2 Text Phenomena that Demonstrate Nuclearity

Several independent facts about text structure support the claim that English texts are structured in nucleus-satellite relations and, therefore, support a theory in which nuclearity is assumed to be a central organizing principle of text structure.

¹²This is always a matter of judgment, but often uncontroversial. People often strongly agree that a text with a particular satellite deleted would be more satisfactory (to the writer, as a substitute text) than a text with a corresponding nucleus deleted.

One way to recognize the functional distinctiveness of nuclei and satellites is to examine the effects of perturbing texts.

10.2.1 Nucleus Deletion and Nuclear Function

We predict that if a particular nucleus is removed, then the significance of the material in its satellite(s) will not be apparent. Very clear examples of this arise when the "most-nuclear" unit of a text (a single unit identified by tracing down through the text structure to the nucleus at each level) is removed. In the Syncom ad, as expected, the significance of the rest of the text would be difficult to infer without unit 2. First, we would have no answer to the question posed in unit 1, *What if you're having to clean floppy drive heads too often?*. Second, we would know neither why the operation of Syncom diskettes was being described in such attentive detail nor why we were being advised to write for a free selection guide.

This finding characterizes our collection of analyzed texts. In the following text, again from the ISI electronic bulletin board, for example, apart from questions of anaphora, the text cannot function as an announcement without the most-nuclear unit, unit 1:

1. The new Tech Report abstracts are now in the journal area of the library near the abridged dictionary.
2. Please sign your name by any that you would be interested in seeing.
3. Last day for sign ups - 31 May.

The interested reader can verify the claim that the most-nuclear unit is essential by experimenting with the examples accompanying the relation definitions.

10.2.2 Satellite Deletion and Nuclear Function

Another prediction that might follow from the claim of nuclearity is: If units that only function as satellites and never as nuclei are deleted, we should still have a coherent text with a message resembling that of the original; it should be something like a synopsis of the original text. If, however, we delete all units that function as nuclei anywhere in the text, the result should be incoherent and the central message difficult or impossible to comprehend.

A test this of prediction against the Syncom text strongly confirm our prediction. Figure 7 shows that the following units are nuclear within some schema in the RST analysis:

1 - 3

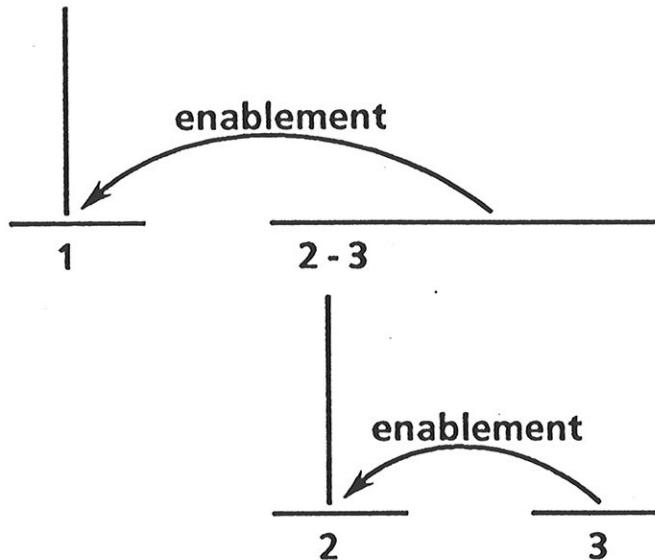


Figure 10: RST diagram for "Tech Reports" text

2. Ask for SYNCOM diskettes, with burnished Ectype coating and dust-absorbing jacket liners
4. a Syncom diskette is working four ways
6. Cleaning agents on the burnished surface of the Ectype coating actually remove build-up from the head
8. A carbon additive drains away static electricity
10. Strong binders hold the signal-carrying oxides tightly within the coating
11. And the non-woven jacket liner ... provides thousands of tiny pockets to keep what it collects
14. send for our free "Flexi-finder" selection guide and the name of the supplier nearest you

While this group of nuclear units lacks some cohesion and the grammar of clause combining is missing, we still have a reasonable idea of what the text is about. It tells us to buy Syncrom diskettes and gives information motivating and enabling us to do so.

In stark contrast is this "text," which consists of those units in the Syncrom ad that function only as satellites:

1. What if you're having to clean floppy drive heads too often?
3. As your floppy drive writes or reads
5. to keep loose particles and dust from causing soft errors, dropouts
7. while lubricating it at the same time
9. before it can attract dust or lint
12. more than just wiping the surface
13. To see which Syncrom diskette will replace the ones you're using now

In both of these two "texts," the grammar of clause combining is inappropriate. The crucial difference is that we can't discern the purpose of the satellite-only text; it is incomprehensible and incoherent. Furthermore, the satellite-only text contains a number of non-sequiturs. Omission of the satellites does not have this effect in the nuclei-only text. These facts constitute strong evidence of the significance of nuclearity for a theory of text structure.

10.2.3 Relations Among Discontinuous Parts of the Text

Nuclearity also accounts for the way discontinuous parts of the text are related. Looking again at the Syncrom ad, an RST analysis reveals the relations among unit 4 and its four **Elaboration** satellites in the Syncrom ad. For instance, the RST analysis in Figure 11 reflects the fact that unit 7 is not perceived as an elaboration of unit 4 and that unit 6 is not taken as an elaboration for unit 3:

3. As your floppy drive writes or reads,
 4. a Syncrom diskette is working four ways
 5. to keep loose particles and dust from causing soft errors, dropouts.
 6. Cleaning agents on the burnished surface of the Ectype coating actually remove build-up from the head,
 7. while lubricating it at the same time.
 8. A carbon additive drains away static electricity
 9. before it can attract dust or lint.
 10. Strong binders hold the signal-carrying oxides tightly within the coating.
- 11A. And the non-woven jacket liner,
 12. more than just wiping the surface,
 - 11B. provides thousands of tiny pockets to keep what it collects.

10.2.4 Hypotaxis

Nuclearity in text structure is a plausible communicative basis for the grammar of hypotactic clause combining, as has been argued in some detail in [Matthiessen & Thompson 86]. Grammars in many languages draw a distinction between hypotactic and main clauses because of the nucleus-satellite distinction in discourse.

10.3 Multi-nuclear Constructs

So far we have assumed that a theory in which relations with a single nucleus play a central role can account for text structure. We have acknowledged that multi-nuclear relations exist and have identified **Sequence** and **Contrast** as useful multi-nuclear relations.

However, nuclearity seems less relevant to other phenomena of text structure, which we will briefly mention in this subsection.

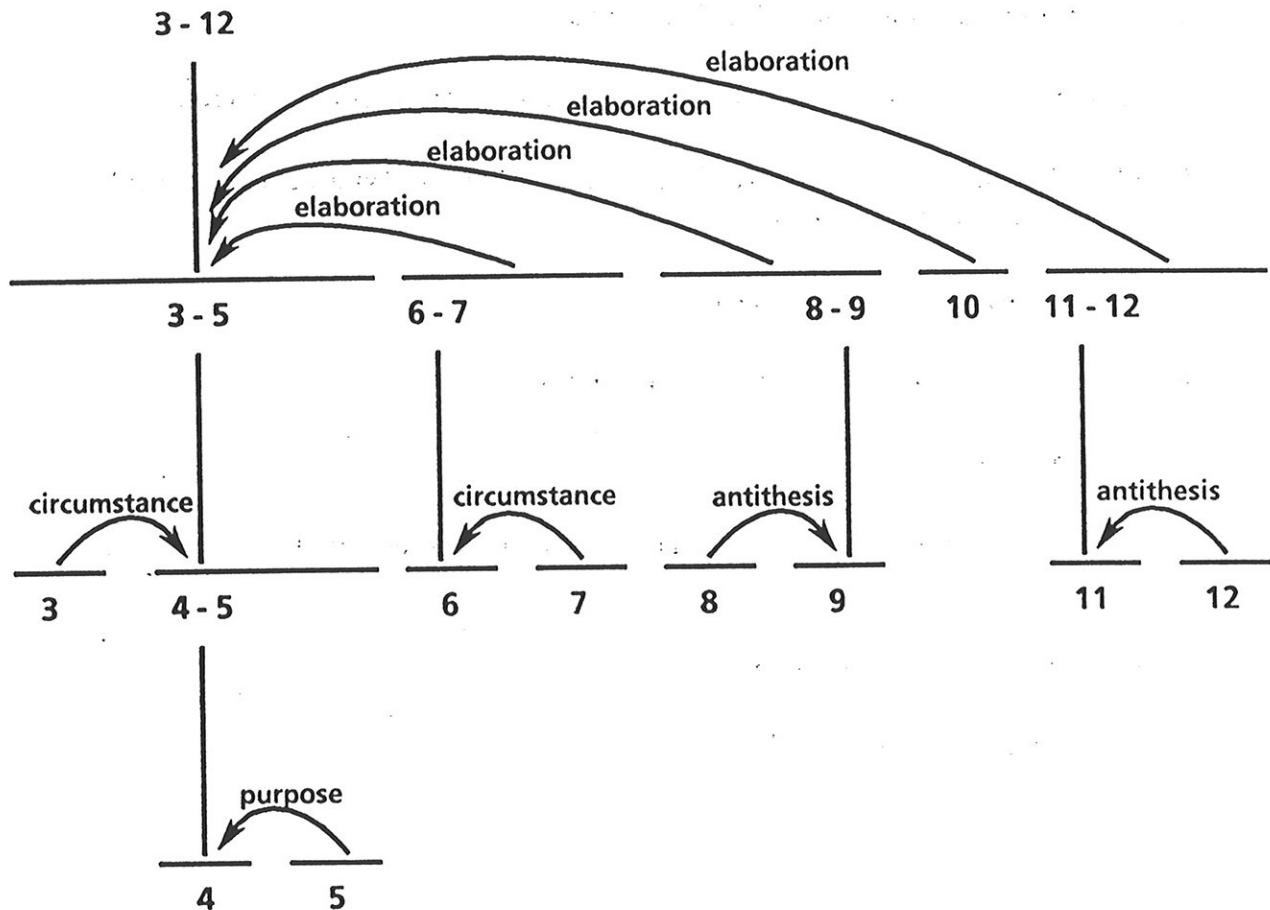


Figure 11: RST diagram for Units 3 - 12 of "Syncrom" text

10.3.1 Enveloping Structures

First, texts with conventional openings and closings are not easily described in terms of nuclearity. Accounting for the overall structure of a letter, for example, requires a different type of structure.

10.3.2 Parallel Structures

Texts in which parallelism is the dominant organizing pattern are also lie beyond the bounds of what can be accounted for by nuclearity. For an illustration and discussion of the structure of such a text, of the "compare and contrast" type, see [Fries 83].

10.4 Functional Interpretation of Nuclearity

Description in terms of function has been involved in every part of this paper; this is clearest in the way relations are defined in terms of their effects. In taking up the functional interpretation of nuclearity, we extend the discussion to additional notions of function. In the case of the relational definitions, the particular effects included as definitional constraints were informally abstracted during the study of various texts, then stipulated as parts of the definitions. The stipulation was successful, in that it did not constrain the relation definitions so much that instances were not recognized in analyses.

In considering the functions of nuclearity, we take a comparable approach but cannot go as far. Particular texts suggest functions of nuclearity, through the elements of the nuclearity pattern and through the instantial patterns in which nuclearity occurs. We can describe these as hypotheses about the functions of nuclearity, but we do not have confirming experience with sufficient quantities of text to see how the hypotheses fare.

Still, it is useful to identify the hypotheses, however informally, as preparation for further study. In doing so we touch on issues that seem as much part of individual or social psychology as of linguistics. Although we use terms that are technical in those fields, our usage is vernacular.

The reality of nuclearity, as a phenomenon, now seems reasonably certain. Nuclearity, like all category judgments of linguistics, has its obscure and borderline cases, but grammaticalization of nuclearity in hypotaxis confirms a strong pattern.

But why does nuclearity arise as a phenomenon? What is its function in communication?

In recognizing text structure, the reader adds structure to a linear string. Even though nucleus and satellite are usually adjacent spans, the writer can use nuclearity to assign them different roles.

If we see part of the function of communication as building memories, then we can see nuclearity as suggesting organizational details of those memories. If the text structure, even in part, represents the access patterns that are facilitated in memory, then nuclearity can be seen as a way to signal that the memory of a satellite can usefully be accessed through memory of the nucleus.

As for memory, so for the immediate function of nucleus and satellite in receiving the text: The satellite gains its significance through the nucleus, so the writer can indicate, by nuclearity, that the nucleus is more deserving of response, including attention, deliberation and reaction.

In both of these ways, the nucleus is more central than the satellite in a literal sense. Taking the center as the structural root of the text (the node representing the entirety) and then tracing out from the root, the nucleus is always encountered before the related satellite. Thus the metaphor of centrality is fulfilled.

Beyond these notions, two sorts of explanations seem appropriate for different classes of relation definitions:

1. When the locus of effect¹³ is the nucleus, as in the **Evidence** relation, nuclearity represents the qualitative differences in role between the essential and the inessential, thought and afterthought. The satellite supports the nucleus, but does not contribute to it. The writer not only makes a distinction between essential and inessential, but also wants the reader to recognize the distinction. Nuclearity provides that recognition.
2. When the locus of effect is both nucleus and satellite, as in the **Condition** and **Elaboration** relations, a different sort of function is performed. The structural difference between nucleus and satellite represents some distinction in the organization of the subject matter. The distinction is presented as important to the reader, and the significance of the satellite tends to be found in the nucleus. Both nucleus and satellite contribute to the result.

Nuclearity is thus an expressive resource that directs the reader to respond to the text in a particular and locally structured way. It seems to strongly influence the overall response that the writer intended.

11 RST in relation to other research

A number of previous researchers have influenced work on this theory of text organization. In this section we will briefly characterize their roles.

11.1 Interclausal relations

An early influence on our work has been that of [Beekman & Callow 74], [Beekman, et. al. 81], [Longacre 76], and [Longacre 83]. These scholars were among the first to attempt a systematic description of interclausal relations in functional terms that would be valid cross-linguistically, that is, independent of the grammatical properties of clause combining in any particular language. In 1974, Beekman and Callow, building on earlier studies of this topic in the literature on Bible translation (see their footnote 2, p. 291), propose "a system of relations between propositions in the context of discourse." Longacre aims to present a "taxonomy of the deep structure of

¹³See Section 2.2.

interclausal relations." He acknowledges [Grimes 75], [Beekman & Callow 74], and the earlier references they cite. However, instead of conceiving of these relations as predicates, he sees them as best described in terms of a propositional calculus.

[Beekman, et. al. 81] present a text analysis based on relationships between clauses and higher units. In their view, clauses and higher-level units group into clusters, with one, or sometimes more unit(s), forming the prominent HEAD. These clauses thus stand in a "HEAD-support" relationship. In some situations, no one clause is more prominent than the others. In this case, they are all HEADS and are said to stand in an "addition" relationship. HEAD-support and addition seem to parallel Grimes' hypotactic and paratactic predicates, respectively. (See Section 11.2 below).

The HEAD-support relation superficially resembles our nucleus-satellite relation. However, our nucleus-satellite distinction is functional and reflects differential goals on the part of the writer; for Beekman et al., the notion of "prominence" and the label HEAD appear to reflect grammatical marking.

[Crothers 79] is concerned with a systematic treatment of the inferential structure of short texts. Although this is more ambitious than the goal we have set for ourselves, Crothers' interest in inference leads him to the issue of "inferred connectives," i.e., interclausal relations that need not be signalled.

Winter, in a number of publications leading up to [Winter 82], and Hoey [Hoey 83] suggest that a productive way of analyzing discourse is to treat it as "the product of semantic relations holding between sentences or propositions" ([Hoey 83], p. 17). Winter's definition of "clause relation" makes it clear that these relations are not restricted to single clauses or sentences, but can include larger spans:

A clause relation is the cognitive process whereby we interpret the meaning of a sentence or group of sentences in the light of its adjoining sentences or groups of sentences. ([Hoey 83], p. 18)

[Hoey 83] discusses a number of clause relations with properties similar to those of our rhetorical relations, such as the Cause-Consequence relation and the Situation-Evaluation relation, though his set of relations has fewer members than ours.¹⁴

Distinct from these clause relations, for Hoey, are what he calls "discourse patterns" which he defines as a "combination of relations organising (part of) a discourse" (p. 31). For detailed study, he chooses the "Problem-Solution" pattern, though he also discusses the "General-Particular" pattern.

¹⁴Hoey also provides a valuable and comprehensive annotated bibliography of work within the Winter tradition and of research on "interclausal relations" and text analysis in general.

Hoey thus distinguishes between relations that bind clauses (or groups of clauses) and those that characterize entire texts. RST differs in claiming that the same sorts of relations characterize text structure at all levels.

The taxonomies offered by these linguists have their differences, but are similar in recognizing relations among clauses and groups of clauses. They all contain relations that we have also found useful.

The primary differences between these works and ours are:

1. For these scholars, relations among parts of a text emanate from the relations among clauses. While all of them acknowledge that these relations might hold among groups of clauses as well, their descriptive modes yield successive combinations of clauses rather than, as in RST, a functional model that asks what the text is doing for the writer. Thus, our set contains a number of relations that do not appear in a taxonomy that designed to account for relations between clauses.
2. While the discourse orientation of the taxonomies of these researchers is evident, they state their taxonomies of interclausal relations in terms of semantic principles of clause combining rather than in terms of discourse-organizing principles.
3. We have found that a general theory of writers' goals is necessary for understanding the rhetorical organization of a text. Thus, the relations of RST are seen as bearing implicit *propositions*, which do part of the work of informing, persuading, motivating, etc. The propositions realize the writer's purpose.
4. In accord with a recognition of writer's goals, RST explicitly recognizes the concept of **nuclearity** -- within a given relation, one part is more central to the writer's goals than the other. None of the theories of interclausal relations examined so far incorporate this functional sense of nuclearity.

11.2 Grimes and related work

The other primary inspiration for RST is Grimes' discussion of "rhetorical predicates" in Chapter 14 of [Grimes 75].

On rhetorical predicates, Grimes proposes on pp. 115-116, that:

...the choices a speaker has available within the content system can be expressed by means of PROPOSITIONAL structure. Each proposition contains a PREDICATE, which expresses a semantic relation among ARGUMENTS, which may themselves be propositions...The predicates whose arguments involve role specifications directly are the ones I call LEXICAL; the one that underlies English *eat* is an example. Those whose arguments are related in other ways I call RHETORICAL; the one that underlies English *because* is an example.

For example, the sentence

he saved the day; he made three touchdowns (p. 213)

can be represented by the rhetorical proposition:

Z gives details for X,

where the rhetorical predicate is SPECIFICALLY, the argument Z = "he made three touchdowns", and X = "he saved the day." Rhetorical predicates can take anything from lexical items to large "semantic subtrees" as arguments.

From this characterization, it is clear that Grimes is discussing what we call rhetorical relations. In spite of such locutions as "the one [predicate] which underlies *because*," his examples show that he does not intend explicit structural elements to realize all rhetorical predicates. We have adopted some of his predicates into our work on RST; for example, the Elaboration relation is essentially Grimes' SPECIFICALLY.

One of the most interesting features of Grimes' presentation of rhetorical predicates is his distinction between "paratactic" and "hypotactic" relations:

PARATACTIC predicates dominate all their arguments in coordinate fashion. HYPOTACTIC predicates have as one of their arguments, the CENTER, a term with respect to which the proposition as a whole is subordinated to some other proposition by being added to it as an extra argument. (p. 209)

Thus in the example given above, argument X ("he saved the day") is considered the CENTER of the hypotactic SPECIFICALLY predicate. Our distinction between nucleus-satellite and multi-nuclear rhetorical relations roughly corresponds to this distinction of Grimes.

One difference between Grimes' work and our own is that Grimes has not commented on the function of his rhetorical predicates, while we see the rhetorical relations functioning as implicit propositions in a text and capable of performing rhetorical acts, just as explicit propositions that appear as clauses perform them (see [Mann & Thompson 86b] for further discussion).

In [Meyer 75], Meyer has made use of Grimes' framework to develop a theory of text structure in terms of the content of a passage. Her theory would account for aspects of text comprehension and recall. She says:

The research to be described in this book explores the effects of certain aspects of the structure among the ideas presented in a passage on what ideas a reader recalls from the passage. (p. 1)

Her technique for "analyzing the text to discover the structure among the ideas in it" is derived from [Grimes 75]. We are not specifically concerned with comprehension and recall, but to the extent that Meyer uses Grimes' approach to rhetorical predicates, the analytical part of her discussion is relevant to and influential upon RST.

In [Meyer 84], Meyer presents further discussion of her adaptation of Grimes' approach as applied to specific texts.

Hobbs, in [Hobbs 85] and in prior work, presents a relational view of the coherence of texts both at and above the clausal level. He sees coherence in a broad inferential framework.

Like Meyer, E. Pike [Pike & Pike 83] (chap. 1) is concerned with the structure of the content of a passage; the "grammatical structure" of a passage describes the events and states of affairs to which it refers. Unlike Meyer, however, Pike is not concerned with the rhetorical relationships among these events, so her analytical goals differ from ours.

Within Natural Language Processing, the work of [McKeown 85], (who has also been influenced by Grimes) is highly relevant, as is the related work of Paris [Paris & McKeown 86].

11.3 Grosz and Sidner's Theory of Discourse Structure

For several reasons it is appropriate to provide a longer comment on the work of Grosz and Sidner. This work shares with RST a motivation from Computational Linguistics, and it is one of those relatively rare efforts whose serious linguistic claims about discourse also have clear computational consequences.

Grosz and Sidner's views on discourse structure are best represented in [Grosz & Sidner 86]. For convenience, we will call Grosz and Sidner's Discourse Theory GSDT.

RST and GSDT are strongly related, partly because they share several important assumptions about the nature of the use of language and how to account for it.

1. Accounting for discourse requires explicit accounts of the involvement of the speaker and hearer. Just analyzing text relative to the conventions of language is inadequate.
2. The structure of discourse reflects more than anything else the intentions and goals of speakers. Intention is generally hierachic.
3. Attention and Intention are usefully regarded as independent interacting aspects of texts.¹⁵
4. We take Grosz and Sidner to be saying that language form, language function and discourse structure are related in a loosely co-constraining way, not by anything resembling one-to-one mappings. Thus there are no structural features that are always signaled uniquely by particular forms. We agree.

One can criticize details, but it is important for us to recognize immediately that Grosz and Sidner have produced an account that captures several of the most significant aspects of text structure. (Like RST, it is far from being a complete account.)

Having affirmed our agreement on some basics, we note that RST and GSDT are very different in scope. GSDT attempts to cover intentional, attentional and "linguistic" phenomena.¹⁶ RST accounts primarily for what Grosz and Sidner would call intentional.¹⁷

GSDT also attempts to cover dialogue, whereas RST in its present form does not. We intend to extend RST to dialogue; we do not expect that extension to change the way RST accounts for monologue.

There are some important differences in the ways that the two theories are specified.

¹⁵We see the Attention group as including many other functions in addition to the referential ones cited by Grosz and Sidner.

¹⁶All of these phenomena are properly linguistic, and have been for decades [Havranek 32], [Danes 74], [Halliday 67], [Halliday 69], [Halliday 70]. Their term "linguistic" refers primarily to the study of utterance forms, including those aspects that realize (express) their intentional and attentional entities.

¹⁷See [Mann 87a] for a discussion of attentional and other discourse phenomena outside of RST.

1. Most importantly, GSDT does not specify where its discourse purposes come from or how they can be constructed or verified. RST has a specific account for how particular purposes (intended effects) are assigned to text spans.
2. Similarly, GSDT does not specify how discourse segmentation is done, and whether it is guided by theory or pretheoretical.

These differences make it difficult to predict just how GSDT would account for a new text.

Grosz and Sidner have rejected the importance of RST (along with comparable work of Hobbs, Grimes, Reichman and others [Grosz & Sidner 86], p. 179, 204), saying "a theory of discourse structure cannot depend on choosing [discourse purposes] from a fixed list..." which reflects an extreme misunderstanding of all of these bodies of work. However, Grosz and Sidner then say that "Although there are an infinite number of intentions, there are only a small number of relations that can hold between them." We could apply the same words in RST. In GSDT the infinity of purposes comes, of course, from the unbounded diversity of the subject matter of text. The set of purposes in RST is similarly infinite. The senses in which the theories are providing structural accounts are parallel.

Rather than seeing GSDT and RST as directly competing theories, we see the potential for an augmentation of each from the other, a kind of synthesis. Such a synthesis seems necessary to account for the range of phenomena and structure that both they and we hope to account for.

GSDT needs augmentation. For example, although Grosz and Sidner cite a paper on relational propositions [Mann & Thompson 86b], they do not provide any account of the two central phenomena of that paper, namely

1. relation-specific assertion-like effects that arise from the use in text of RST's relations, and
2. coherence produced by the relational propositions, and incoherence produced by disrupting them. (In its present form GSDT does not provide any account for coherence.)

Since these effects are relation-specific, they are not accounted for in GSDT. In fact, nothing in GSDT suggests that it can account for them. Similarly it does not account for nuclearity.

Comparison of the two approaches suggests additional differences. There appear to be structural configurations, including non-interruptive discontinuous schema applications, that are allowed in RST, found in natural text, but not allowed in GSDT. RST generally produces a finer-grained account, identifying goals that GSDT misses. GSDT makes some constructs propositional even though they are recognizably

structural, are lexicalized as discourse structures and have characteristic "cue phrases"; concessives with *although* are one kind. And RST seems capable of providing a fuller account of the "cue phrases" than GSCT. For a fuller description of how these theories are related, and a discussion of the prospects for an inferential absorption of text relations into GSCT, see [Mann 87b], which is expected to be available in the fall of 1987.

Let us suggest the way to a more constructive synthesis. Grosz and Sidner posit goals or purposes for the major structures which they recognize. So does RST. Sometimes these goals coincide. For text analysis purposes one can take the union of the GSCT and RST accounts as an analytic hypothesis, one that can be internally reconciled and refined to produce an intentional and attentional analysis of a text.

11.4 Martin's Conjunctive Relations

Taking Halliday and Hasan's discussion of "conjunction" [Halliday & Hasan 76] as his starting point, Martin [Martin 83] proposes a detailed Systemic analysis of English conjunctive relations. For him, "CONJUNCTION is the semantic system whereby speakers relate clauses in terms of temporal sequence, consequence, comparison, and addition" (p. 1). He goes on to acknowledge that "these logical relations may or may not be made explicit" (p. 1).

Martin considers types of relations similar to those that underlie our rhetorical relations. As in our framework, Martin acknowledges relations among spans of text larger than single clauses. However, Martin's treatment of these relations differs from ours in several respects.

1. Martin recognizes a set of relations restricted to those potentially realizable by an adverbial or phrasal signal for one of three types of clause-connecting patterns:
 - a. nonsubordinating
 - b. subordinating finite
 - c. subordinating nonfinite

We think that rhetorical relations exist independently of any explicit signals; thus, that some types of rhetorical relations have no corresponding conjunctive signals.

2. As pointed out above, respect to the research on interclausal relations, our rhetorical relations are dynamic as communicative *acts*. They function to achieve certain goals for the writer. Martin's conjunctive relations are static elements of a taxonomy in a semantic system.

Like Hoey, Martin makes a distinction between relations holding at the interclausal level and larger-scale discourse patterns. The latter are considered aspects of a still-to-be-articulated theory of "generic structure."

11.5 Jordan

Jordan [Jordan 84] aims to provide an understanding of "structures in everyday English prose" and "the features of language that signal these structures" (p. 1). His discussion is specifically concerned with the "basic metastructure of information." Recalling Hoey, Jordan describes the metastructure in terms of the sequence Situation-Problem-Solution-Evaluation:

...texts involving problems and problem-solving are extremely common in all walks of professional and personal life ... the communication of problem recognition, solutions and their evaluation is an issue of central importance to all of us. (p. 20)

By focusing on texts oriented to problem-solving, Jordan can insightfully reveal a number of features of English prose writing. Our approach differs from his in that:

1. We are interested not just in large-scale patterns for expository prose texts, but in the rhetorical organization of such texts from the highest level down to the level of the clause.
2. Our purpose is to articulate a theory of text structure that can reveal the rhetorical organization of any text, not just those exhibiting a problem-solving organization.

12 Conclusions

The definitions in this paper provide a specific and examinable interpretation for an RST structural analysis. They identify the sorts of facts and judgments on which such an analysis is based, and they provide most of the framework needed for analyzing new texts.

As a descriptive framework for text, Rhetorical Structure Theory offers a combination of features that has turned out to be useful in several kinds of discourse studies. It identifies hierarchic structure in text. It describes the relations among text parts in functional terms, identifying both the transition point of a relation and the extent of the items related. It provides comprehensive analyses rather than selective commentary. It is unaffected by text size and has been usefully applied to a wide range of text size.

Because of the nucleus-satellite distinction, RST is a descriptive basis for studying clause combining. And because text relations have particular assertional effects, RST provides a basis for studying coherence in discourse.

Thus, RST is a linguistically useful account of the nature of text, both because it describes such phenomena as nuclearity and hierarchy and because it is a viable descriptive starting point for a wide variety of studies.

I. Appendix: More Relations

This appendix presents all of the relation definitions except for the ones (Evidence, Justify, Concession and Antithesis) already presented in Section 3, organized following the grouping shown in Table 1 in that section.

Despite our efforts to say the opposite, some have read our other papers as suggesting that the relations are a closed list, a kind of one-dimensional text theory. We see it as an open set, susceptible to extension and modification for the purposes of particular genres and cultural styles. The relations in this paper are sufficient to account for a large proportion of the texts we have encountered. Although they include all of the high frequency relations, there are others.

A number of the relations we will discuss below are also discussed and illustrated, with some differences, in [Noel 86].

I.1 Circumstance

relation name: CIRCUMSTANCE

constraints on N: none

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

The satellite in a Circumstance relation sets a framework, e.g., a temporal or spatial framework, within which to interpret the nucleus. This function has been grammaticalized in English in the form of circumstantial hypotactic clauses; here is an example extracted from a humorous newspaper column by Erma Bombeck:

1. Probably the most extreme case of Visitors Fever I have ever witnessed was a few summers ago
2. when I visited relatives in the Midwest.

Figure I-1 shows the analysis of these two units, where the satellite unit 2 provides the temporal framework for interpreting the nuclear unit 1.

The following extract, from a column in the July 1982 guide for a Los Angeles

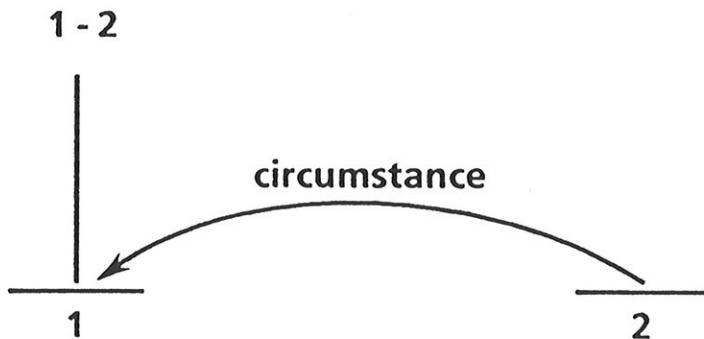


Figure I-1: RST diagram for "Visitors Fever" text

public radio program called "Meet the Announcers", shows that the **Circumstance** satellite need not take the form of a hypotactic clause; the **Circumstance** satellite unit 5 is an independent clause. Figure I-2 shows the structure.

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

Circumstance differs from **Condition** (see Section I.7) in that a **Condition** satellite presents an unrealized situation, while a **Circumstance** satellite does not. The definitions make this distinction explicit.

Notice that the definition does not rely on morphological or syntactic signals. Recognition of the relation always rests on functional and semantic judgments alone. We have found no reliable, unambiguous signals for any of the relations.

I.2 Solutionhood

Here is an example from a set of instructions on redistributing the filler in a sleeping bag:

1 - 5

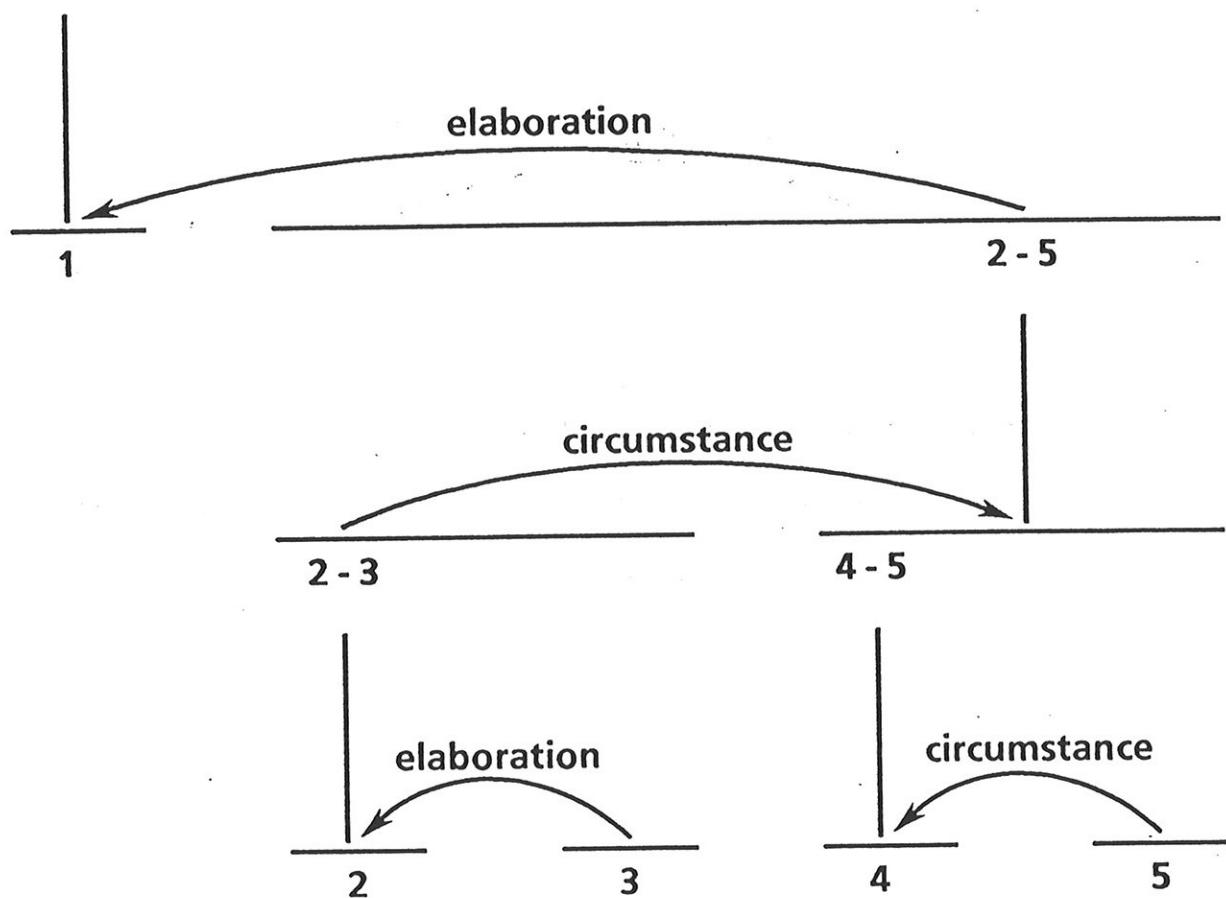


Figure I-2: RST diagram for "Meet the Announcers" text

relation name: SOLUTIONHOOD

constraints on N: none

constraints on S: presents a problem

constraints on the N + S combination:

the situation presented in N is a solution to the problem stated in S;

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

locus of the effect: N and S

1. One difficulty ... is with sleeping bags in which down and feather fillers are used as insulation.
2. This insulation has a tendency to slip towards the bottom.
3. You can redistribute the filler.
4. ... 11.

The rest of the text, not given here, details how to redistribute the filler. Units 3 - 11 clearly provide the solution to the problem presented in units 1 - 2. Figure I-3 shows the RST diagram of this text.

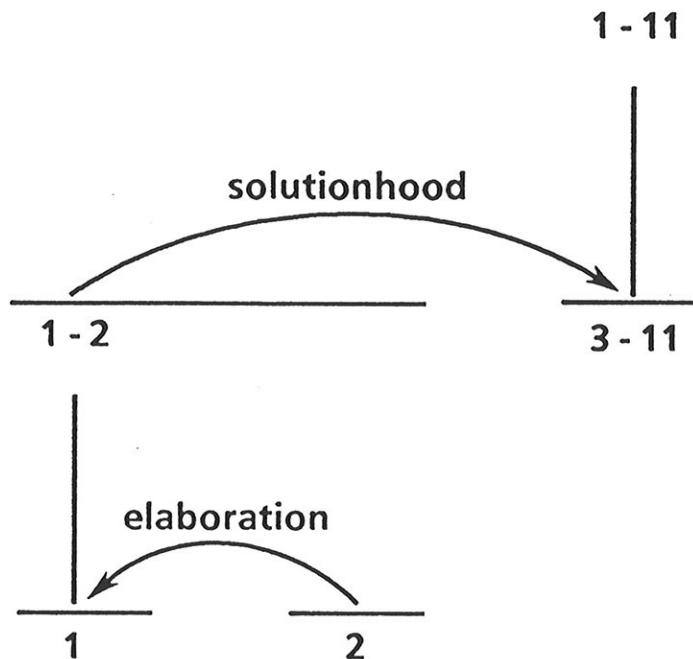


Figure I-3: RST diagram for "Sleeping Bag" text

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].

I.3 Elaboration

relation name: ELABORATION

constraints on N: none

constraints on S: none

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.¹⁸

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

This announcement from the newsletter *Language Sciences* nicely illustrates Elaboration.

¹⁸The definition of Elaboration allows for the possibility that, instead of one relation of Elaboration, one might want to propose each of the six subtypes as a distinct relation [Mann 87a]. We have chosen not to do this, but to regard them as subtypes.

1. Sånga-Säby-Kursgård, Sweden, will be the site of the 1969 International Conference on Computational Linguistics, September 1-4.
2. It is expected that some 250 linguists will attend from Asia, West Europe, East Europe including Russia, and the United States.
3. 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.

Given that the goal of the text is to notify readers of the conference, we take unit 1 as nuclear. The satellites, units 2 and 3 provide further detail about the conference mentioned in unit 1.

The RST analysis of this text is in Figure I-4.

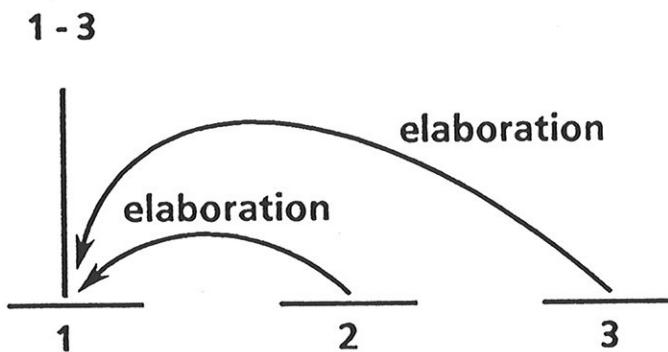


Figure I-4: RST diagram for "Conference" text

A full analysis of a text notes information on elaborations beyond the structure itself, namely the identity of the element of subject matter (which could be as extensive as the nucleus itself) being elaborated. So, for example, we note that the conference, rather than Sweden, is the element elaborated.

I.4 Background

The **Background** relation appears in the first two paragraphs of a notice in a UCLA personnel newsletter:

=====

relation name: BACKGROUND

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

constraints on S: none

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

=====

1. Home addresses and telephone numbers of public employees will be protected from public disclosure under a new bill approved by Gov. George Deukmejian.
2. 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.

In these two paragraphs, unit 2 provides material necessary for comprehending of the element of subject matter "a new bill" in unit 1 by stating that it amends an earlier disclosure policy in the Government Code.

I.5 Enablement and Motivation

The relations **Enablement** and **Motivation** form a subgroup, since both evoke a reader action. That is, they are found in texts that exhort readers to act by presenting offers, requests, invitations, commands, or suggestions. **Enablement** provides information designed to increase the reader's ability to perform the action; **Motivation** provides information designed to increase the reader's desire to perform the action.

I.5.1 Enablement

=====

relation name: ENABLEMENT

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

constraints on S: none

constraints on the N + S combination:

R comprehending S increases R's potential ability to perform the action presented in N

the effect: R's potential ability to perform the action presented in N increases

locus of the effect: N

=====

An example of **Enablement** appears in a squib from the magazine *Environmental Action*. It begins:

1. Training on jobs. A series of informative, inexpensive pamphlets and books on worker health discusses such topics as filing a compensation claim, ionizing radiation, asbestos, and several occupational diseases.

After a description of these materials, unit 6 gives the enabling information:

6. For a catalog and order form write WIOES, 2520 Milvia St., Berkeley, CA 95704.

Without specifying the intervening material, this text can be diagrammed as in Figure I-5:

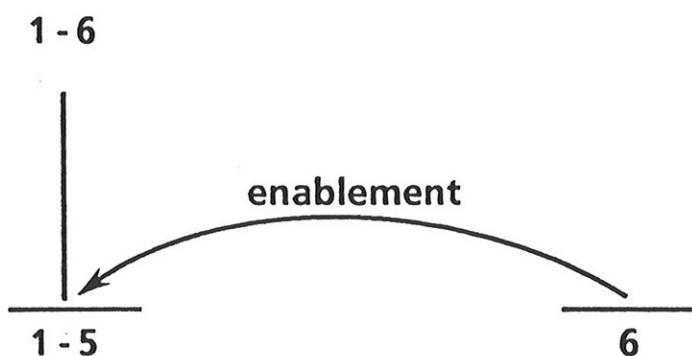


Figure I-5: RST diagram for "Training" text

I.5.2 Motivation

Like **Enablement**, the **Motivation** relation is commonly found in texts evoking an action on the part of the reader; advertising text typically largely consists of motivating material. Here is a non-advertising example from an invitation that appeared on the electronic bulletin board at ISI:

relation name: 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 S: none

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

1. The Los Angeles Chamber Ballet (the ballet company I'm dancing with) is giving 4 concerts next week ...

2. Tickets are \$7.50 except for the opening night ...

3. The show is made up of new choreography and should be very entertaining.

4. I'm in 3 pieces.

Clearly, units 3 and 4 are intended to motivate the author's co-workers to attend the performance. This extract is diagrammed in Figure I-6.

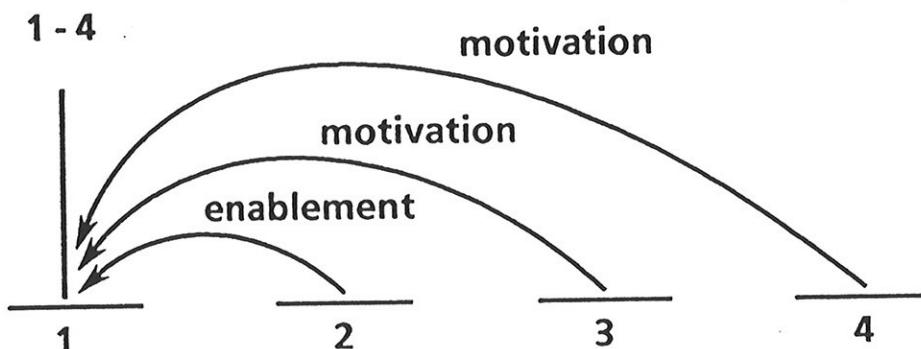


Figure I-6: RST diagram for "Ballet" text

I.6 The "Cause" Cluster: Cause, Result, and Purpose

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. Figure I-7 indicates some of the systematic variation in the definitions.

DIFFERENCES IN NUCLEARITY			
DIFFERENCES IN VOLITION	Volitional Cause	Volitional Result	
	Non-Volitional Cause	Non-Volitional Result	

Figure I-7: Differences Between Cause and Result Relations

The five relations considered in this subsection all involve causation. Relations in this cluster can, of course, be categorized in many ways (see, e.g., [Longacre 83], [Grimes 75]). The distinctions among the five relations discussed below have proven to be the most useful for our purposes.

The nuclearity of the causing situation distinguishes Cause and Result relations. When the causing situation is the satellite, we refer to that relation as either **Volitional Cause** or **Non-Volitional Cause**; when the causing situation is nuclear and the caused situation is less central, we refer to that relation as either **Volitional Result** or **Non-Volitional Result**.¹⁹ Within each of the Cause and Result pairs, we can distinguish Volitional and Non-Volitional variants. Purpose is definitionally neutral, including both volitional and non-volitional cases.

Volitional cause involves the action of an agent, typically a person, who controls an action that yields the nuclear situation. It is performed because the agent prefers the outcome or possibly the action itself. Non-volitional cause is the residue -- consequentiality without a chosen outcome.

I.6.1 Volitional Cause

The following extract from a personal letter illustrates the **Volitional Cause** relation:

¹⁹See Section 10 for a discussion of discerning nuclearity.

relation name: VOLITIONAL CAUSE²⁰

constraints on N: presents a volitional action or else a situation that could have arisen from a volitional action

constraints on S: none

constraints on the N + S combination:

S presents a situation that could have caused the agent of the volitional action in N to perform that action; without the presentation of S, R might not regard the action as motivated or know the particular motivation; N is more central to W's purposes in putting forth the N-S combination than S is.

the effect: R recognizes the situation presented in S as a cause for the volitional action presented in N

locus of the effect: N and S

17. Writing has almost become impossible

18. so we had the typewriter serviced

19. and I may learn to type decently after all these years.

Here, unit 17 provides the cause of the volitional action presented in units 18 - 19, as diagrammed in Figure I-8.

Volitional Cause is sometimes confused with **Motivation**. Our definitions distinguish them, in that the intended effect of the **Motivation** relation to make the reader want to perform an action evoked in the text.

I.6.2 Non-Volitional Cause

The following example comes from a public relations advertisement from an Australian mining firm. In this text, the firm is justifying extensive extraction of natural resources by pointing to the economic benefits to Australians:

²⁰This relation resembles the one we identified in [Mann & Thompson 86b] as Reason. We have changed the name to emphasize the similarities among the five relations in the Cause cluster.

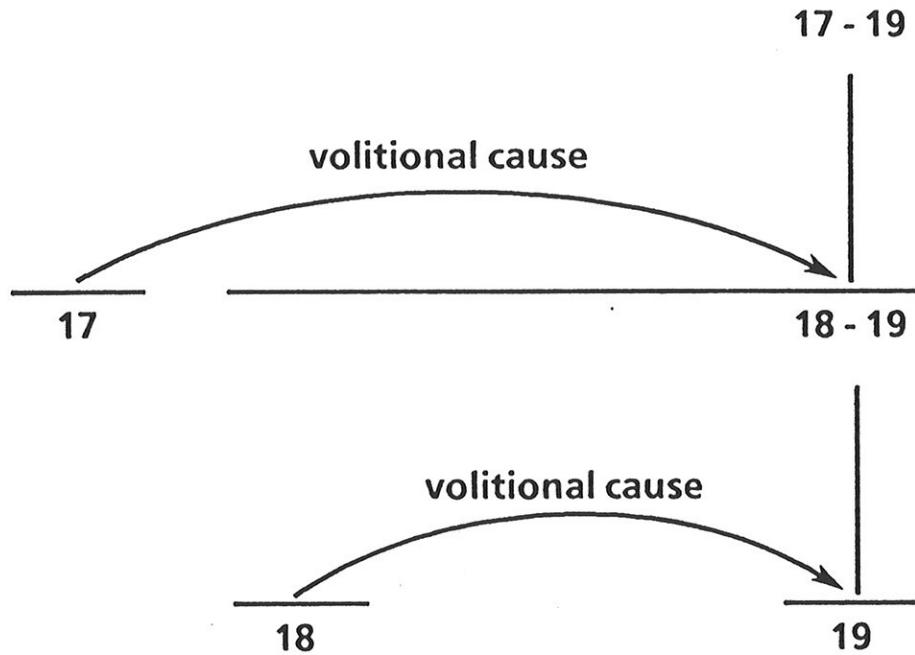


Figure I-8: RST diagram for "Type Decently" text

relation name: NON-VOLITIONAL CAUSE

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

constraints on S: none

constraints on the N + S combination:

S presents a situation that, by means other than motivating a volitional action caused the situation presented in N; without the presentation of S, R might not know the particular cause of the situation; a presentation of N is more central than S to W's purposes in putting forth the N-S combination.

the effect: R recognizes the situation presented in S as a cause of the situation presented in N

locus of the effect: N and S

1. ...we've been able to mine our own iron ore, coal, manganese, dolomite, all the materials we need
2. to make our own steel.
3. And because we can mine more than we need,
4. we've had plenty of manganese and iron ore for export.

In this extract, unit 3 presents a cause for the situation presented in unit 4.

Figure I-9 shows the RST analysis of this extract.

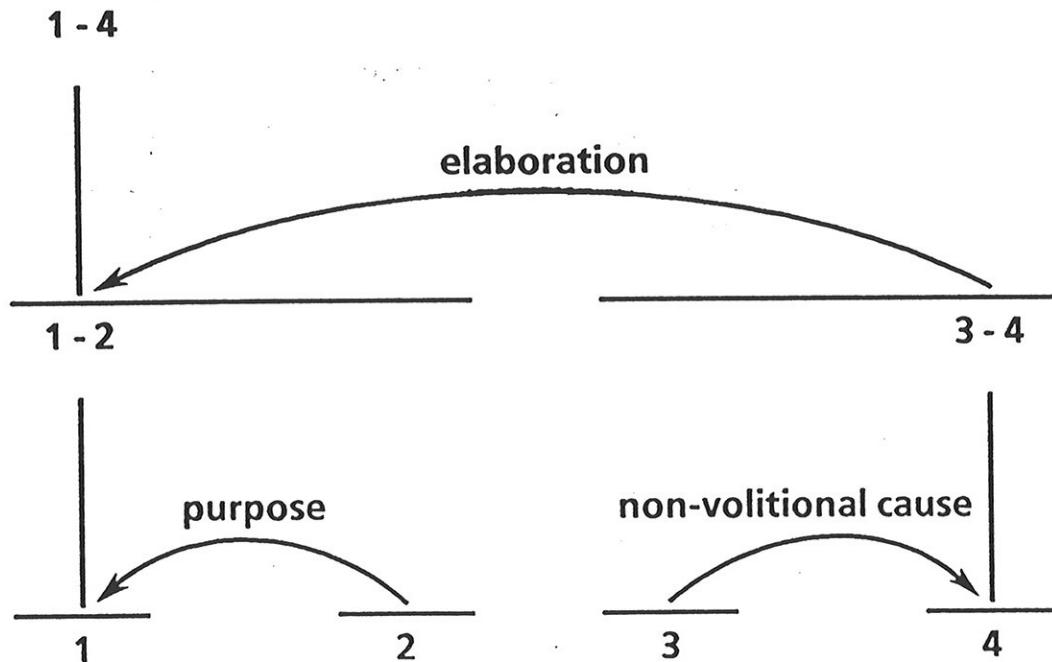


Figure I-9: RST diagram for "Australian Mining" text II

Non-volitional cause also includes cases in which the nuclear outcome results from application of a deductive process. For example, the following abstract from Scientific American magazine exhibits a deduction from general moral obligation to specific obligation to act.

The Transfer of Technology to Underdeveloped Countries²¹

1. The elimination of mass poverty is necessary to supply the motivation for fertility control in such countries.
2. Other countries should assist in this process,
3. not least because they have a moral obligation to do so.

Unit 3 presents the general moral obligation; unit 2 presents the obligation for assistance, which is deduced from the more general obligation. Figure I-10 shows the RST analysis of the abstract.

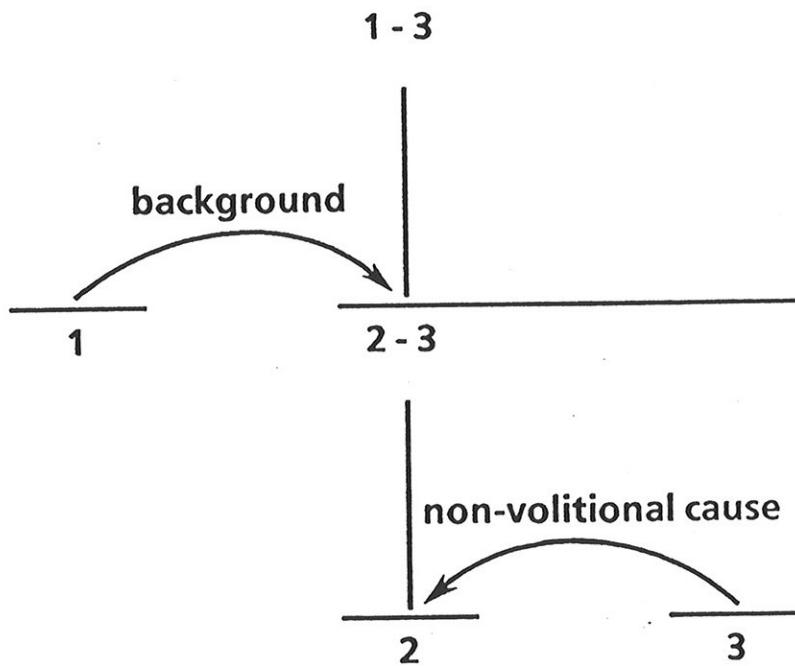


Figure I-10: RST diagram for "Transfer of Technology" text

²¹Again, we are not considering the title to be one of the units of analysis; it is included here to provide the antecedent for *such* in unit 1.

I.6.3 Volitional Result

relation name: VOLITIONAL RESULT

constraints on N: none

constraints on S: presents a volitional action or a situation that could have arisen from a volitional action

constraints on the N + S combination:

N presents a situation that could have caused the situation presented in S; the situation presented in N is more central to W's purposes than is that presented in S;

the effect: R recognizes that the situation presented in N could be a cause for the action or situation presented in S

locus of the effect: N and S

The following example is from an earlier part of the personal letter considered in connection with Figure I-8; Cousin Margaret explains that she can't visit because she is going to have thumb surgery. After a 12-unit discussion of the history of the problem, she concludes:

- * Using thumbs is not the problem
- * but heredity is,
- * and the end result is no use of thumbs
- * if I don't do something now.

To this nuclear material, Cousin Margaret then adds the following **Volitional Result** satellite, whose structure was given in Figure I-8.

5. Writing has almost become impossible
6. so we had the typewriter serviced
7. and I may learn to type decently after all these years.

I.6.4 Non-Volitional Result

For an example of the **Non-Volitional Result** relation, we turn to [Noel 86], p. 88 ff.. This is from a BBC World Service news item about an explosion in a Mexican gas storage facility:

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

relation name: NON-VOLITIONAL RESULT

constraints on N: none

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

In this extract, unit 1, which gives the information about the explosion, is nuclear and presents the cause of the injuries presented in units 2 - 3. The definition of Non-Volitional Result thus applies; the causing situation is nuclear and the caused situation is non-volitional.

Figure I-11 shows the analysis of this extract. Like Non-Volitional Cause, Non-Volitional Result includes deductive cases.

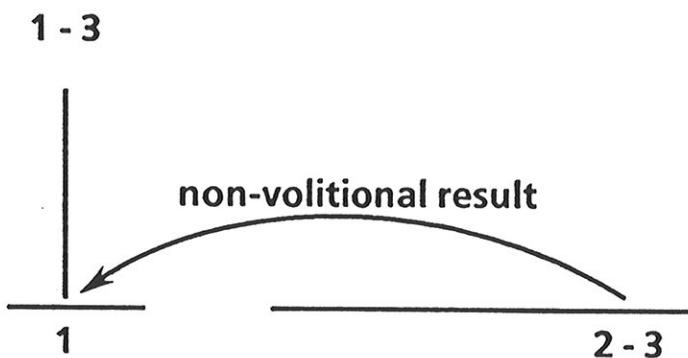


Figure I-11: RST diagram for "Blast" text

I.6.5 Purpose

This extract, from the end of an advertisement for floppy diskettes, illustrates the Purpose relation.

relation name: 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

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

The Purpose relation is easily identified here. The nucleus, unit 2, presents the activity of sending for the selection guide and name of nearest supplier, which is supposed to be initiated with the aim of seeing which Syncrom diskettes should replace the ones the reader is now using. The text is diagrammed in Figure I-12.

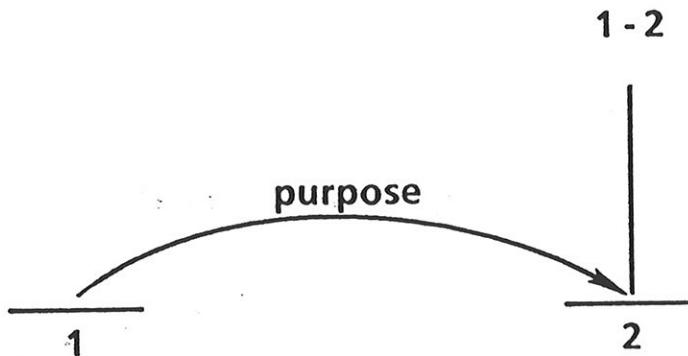


Figure I-12: RST diagram for "Replacement Disk" text

As mentioned above, the Purpose relation is definitionally neutral with respect to volition. Purpose satellites can be associated with nuclei that are not, strictly speaking, volitional.

The example below is from a book on size effects in biological evolution [McMahon & Bonner 83], p. 140:

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.

However, in all such examples that we have found or imagined, some purpose seems implied. That is, there is in the subject matter some tendency toward particular classes of outcomes or states, and the span that expresses purpose identifies those outcomes or states for which the tendency supposedly exists.

In the example just cited, the purpose clause implies a teleological perspective on anatomical attributes. From this perspective, trees are as they are because they are embedded in a framework in which organisms tend toward photosynthesis maximization.

I.7 Condition and Otherwise

These two relations share the property that realization of the situation in the nucleus has something to do with the realization of the situation in the satellite. The difference between the two is that with **Condition**, the realization of the nuclear situation depends on the positive realization of the satellite situation; with **Otherwise**, realization of the nuclear situation prevents realization of the satellite situation.

I.7.1 Condition

relation name: CONDITION

constraints on N: none

constraints on S: S presents a hypothetical, future, or otherwise unrealized situation (relative to the situational context of S)

constraints on the N + S combination:

Realization of the situation presented in N depends on realization of that presented in S

the effect: R recognizes how the realization of the situation presented in N depends on the realization of the situation presented in S

locus of the effect: N and S

The **Condition** relation has been grammaticalized in English by the hypotactic conditional clause. However, as with all our relations, which are textual relations rather than grammatical, **Condition** need not be expressed with an *if* clause.

While it might not seem necessary to illustrate the **Condition** relation, we do so here to show that a **Condition** satellite can be signalled in many ways. This extract, which was diagrammed in Figure I-20 above, appeared as a notice in the UCLA Personnel News, a staff newsletter; a **Condition** satellite is italicized:

1. Employees are urged to complete new beneficiary designation forms for retirement or life insurance benefits
2. whenever there is a change in marital or family status.
3. We have recently had cases where divorced spouses have received benefits
4. because the employee neglected to complete a new beneficiary form designating a new spouse or child.

This text illustrates a **Condition** relation signalled by *whenever*: the satellite names an unrealized situation, and the situation named in the nucleus depends for its realization on the realization of that in the satellite.

I.7.2 Otherwise

relation name: OTHERWISE

constraints on N: presents an unrealized situation

constraints on S: presents an unrealized situation

constraints on the N + S combination:

realization of the situation presented in N prevents realization of the situation presented in S

the effect: R recognizes the dependency relation of prevention between the realization of the situation presented in N and the realization of the situation presented in S

locus of the effect: N and S

The beginning of another announcement on the ISI electronic bulletin board illustrates the **Otherwise** relation:

1. It's new brochure time,
2. and that means a chance for new project write-ups.

3A. Anyone

4. desiring to update their entry in this brochure

3B. should have their copy in by Dec. 1.

5. Otherwise the existing entry will be used.

Here, realization of the command in the nuclear unit 3, turning in the new write-ups, will prevent realization of the situation in unit 5, use of the existing entry. This extract is analyzed in Figure I-13.

Notice that our definition does not cover the following type of example:

If A, then B. Otherwise (i.e., if not A, then) C

Such examples no doubt exist, but not in our corpus; we will have nothing further to say about their treatment in a theory of text structure.

I.8 Interpretation and Evaluation

The **Interpretation** and **Evaluation** relations involve assessing nuclear material in terms of some frame of reference that is not part of the subject matter of the nucleus itself. The difference is that **Evaluation** relates the nuclear situation to a scale of positive regard on the part of the writer, while **Interpretation** relates the nuclear situation to any other frame of ideas.

I.8.1 Interpretation

The **Interpretation** relation appears in this extract from an economic analysis text:

1. Steep declines in capital spending commitments and building permits, along with a drop in the money stock pushed the leading composite down for the fifth time in the past 11 months to a level 0.5% below its high in May 1984.
2. Such a decline is highly unusual at this stage in an expansion;

Here, the satellite unit 2 relates the nuclear unit 1 to a framework of ideas that interprets the declines mentioned in unit 1 in terms of cycles of economic activity. Figure I-14 shows the RST analysis of this extract.

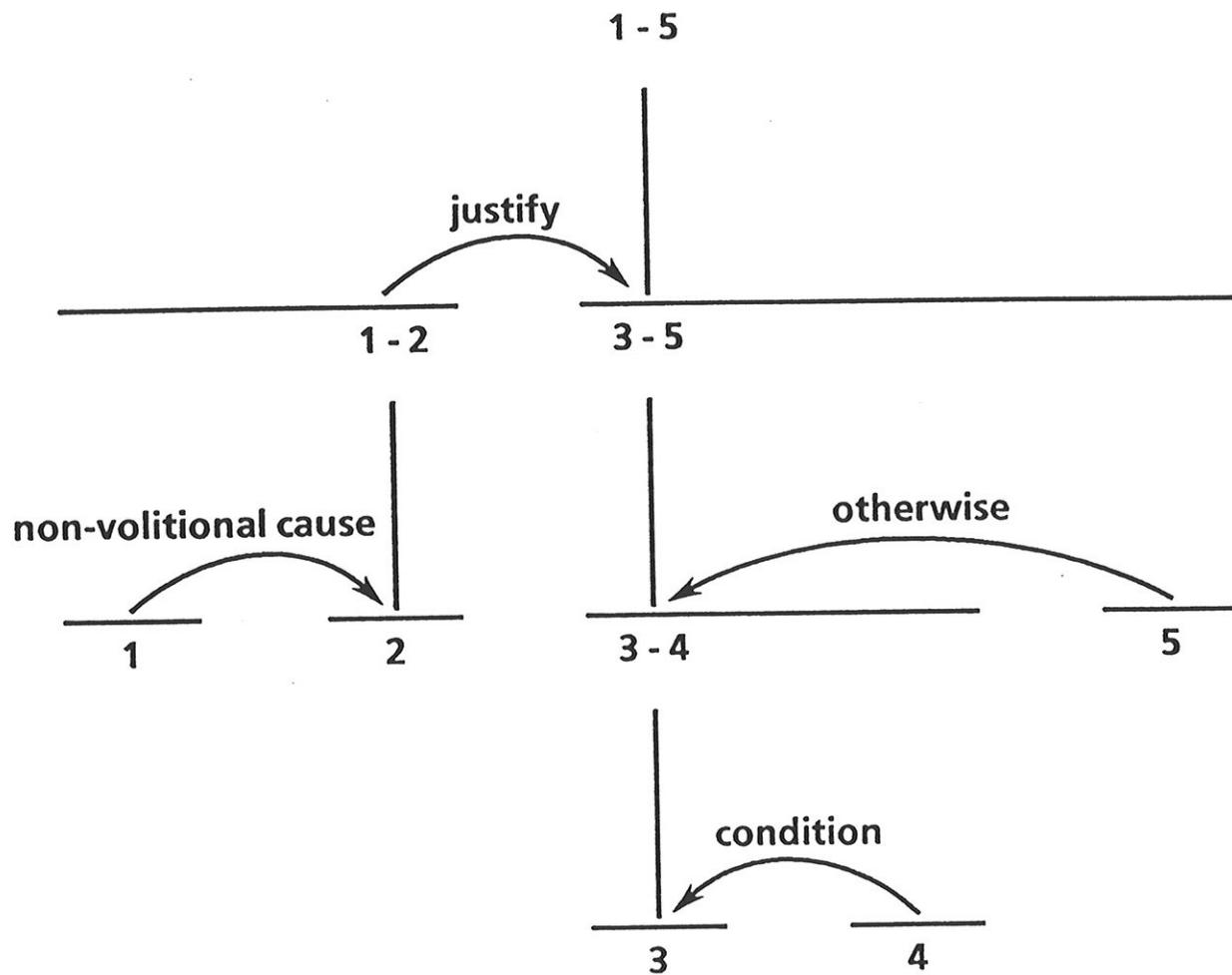


Figure I-13: RST diagram for "Update" text

For another example and further discussion of this relation, see [Noel 86], p. 101ff.

I.8.2 Evaluation

This example of **Evaluation** is taken from an ad for Memorex computer discs:

relation name: INTERPRETATION

constraints on N: none

constraints on S: none

constraints on the N + S combination:

S relates the situation presented in N to a framework of ideas not involved in N itself and not concerned with W's positive regard²²

the effect: R recognizes that S relates the situation presented in N to a framework of ideas not involved in the knowledge presented in N itself

locus of the effect: N and S

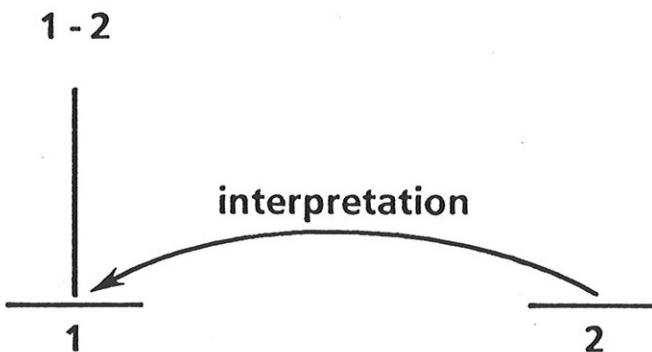


Figure I-14: RST diagram for "Declines" text

1. Features like our uniquely sealed jacket and protective hub ring make our discs last longer.
2. And a soft inner liner cleans the ultra-smooth disc surface while in use.
3. It all adds up to better performance and reliability.

Obvious to any member of our consumer culture is the evaluative contribution of unit 3: It assesses the knowledge presented in units 1 - 2 in terms of the writer's positive regard.

²²Excluding W's positive regard differentiates this from the Evaluation relation.

relation name: EVALUATION

constraints on N: none

constraints on S: none

constraints on the N + S combination:

S relates the situation in N to degree of W's positive regard toward the situation presented in N.

the effect: R recognizes that the situation presented in S assesses the situation presented in N and recognizes the value it assigns

locus of the effect: N and S

Figure I-15 shows the RST analysis of this extract.

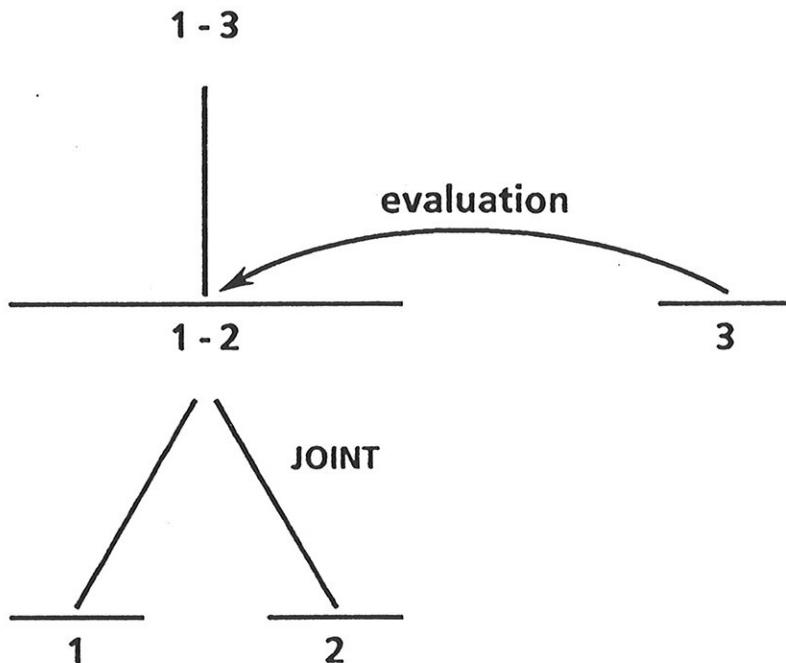


Figure I-15: RST diagram for "All Adds Up" text

I.9 Restatement and Summary

The Restatement and Summary relations both involve restatement, but they differ in the bulk in the restatement. Restatement holds when the bulk of a satellite is roughly the same as that of the nucleus; Summary holds when the satellite is substantially smaller in bulk than the nucleus.

I.9.1 Restatement

relation name: RESTATEMENT

constraints on N: none

constraints on S: none

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

A good example of Restatement appears in the advertisement for a car-cleaning business discussed in [Noel 86], p. 69. We will give only the first two units here. The first is, presumably, set apart from the rest of the text for the sake of capturing attention:

1. A WELL-GROOMED CAR REFLECTS ITS OWNER
2. The car you drive says a lot about you.

This relation can be schematically diagrammed as in Figure I-16.

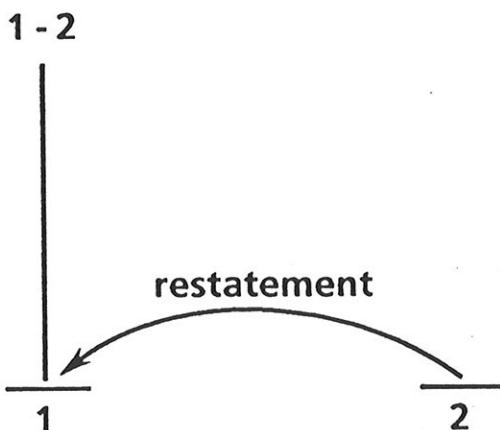


Figure I-16: RST diagram for "Well Groomed Car" text

I.9.2 Summary

relation name: SUMMARY

constraints on N: N must be more than one unit

constraints on S: none

constraints on the N + S combination:

S presents a restatement of the content of N, that is shorter in bulk

the effect: R recognizes S as a shorter restatement of N

locus of the effect: N and S

The ad for Memorex discs discussed in connection with Figure I-15 also has an instance of the **Summary** relation. The ad consists of 16 clause-length units. The nuclear unit 1 urges the reader to buy Memorex discs:

1. For top quality performance from your computer, use the flexible discs known for memory excellence.

The next 14 units motivate and enable this exhortation. The final unit of the text summarizes the details of the two points made in unit 1:

16. It's a great way to improve your memory and get a big bonus in computer performance.

Figure I-17 diagrams this relation.

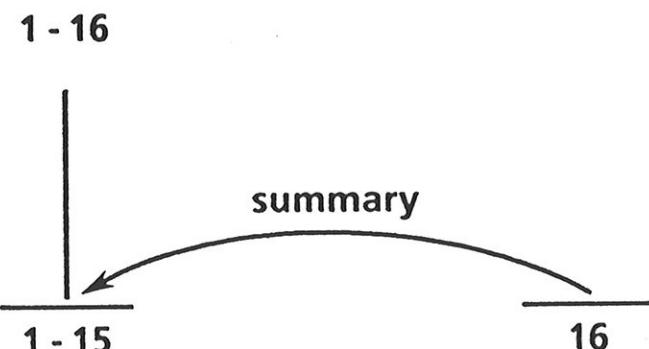


Figure I-17: RST diagram for "Memory and Performance" text

I.10 Other Relations

Among the relations which we have considered but have not formulated definitions for are **Comparison**, **Presentational Sequence**, **Disjunction** and **Means**. We have also decided against a relation **Quote**. Justification for this decision includes:

1. Passages that present who said what or attribute information to certain sources rarely relate to other text spans in such a way that relational propositions arise;
2. The function of such attribution is in the domain of evidentiality with respect to the attributed material and thus is reasonably considered not as a distinct entity, but as part of the proposition that contains the attributional passage.

Cf. [Noel 86] for a similar conclusion with respect to attributed material in BBC news broadcasts.

I.11 The Multi-Nuclear Relations Sequence, Contrast, and Joint

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

I.11.1 Sequence

relation name: SEQUENCE

constraints on N: multi-nuclear

constraints on the combination of nuclei:

A succession relationship between the situations is presented in the nuclei²³

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

locus of the effect: multiple nuclei

Recipes make good examples for the **Sequence** relation. This one is for "Orange Ambrosia" (the list of ingredients and their amounts is omitted):

²³Note that the definition does not cover presentational sequence, e.g., "First ... ; Second ..." See the discussion of presentational relations in Section 5.

1. Peel oranges
2. and slice crosswise.
3. Arrange in a bowl
4. and sprinkle with rum and coconut.
5. Chill until ready to serve.

Figure I-18 shows the RST analysis of this text and its **Sequence** relation.

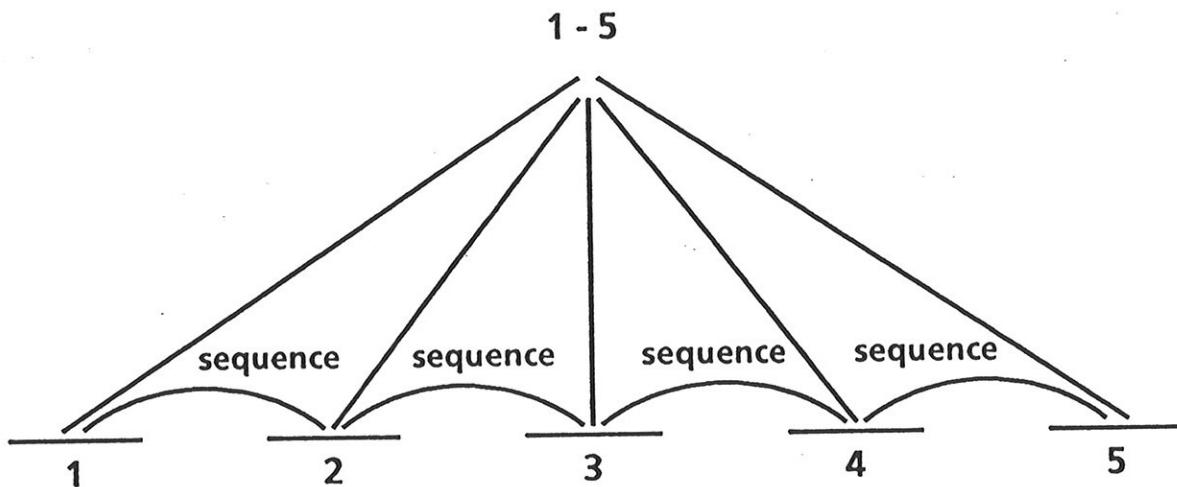


Figure I-18: RST diagram for "Orange Ambrosia" text

Temporal succession is not the only type of succession for which the **Sequence** relation might be appropriate. Others could include descriptions of a group of cars according to size or cost, colors of the rainbow, who lives in a row of apartments, etc.

It is worth pointing out that **Sequence** is the only relation to impose an order on the spans it covers. See Section 4 for a discussion of span order.

I.11.2 Contrast

The first two units in this abstract introducing a *Scientific American* article nicely illustrate **Contrast**:

relation name: 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

1. Animals heal,
2. but trees compartmentalize.
3. They endure a lifetime of injury and infection
4. by setting boundaries that resist the spread of the invading microorganisms.

Units 1 and 2 of this text clearly fit the definition of **Contrast**: Animals and trees are similar in being living organisms, but differ in many respects. Units 1 and 2 compare one of these differences, namely their reactions to injury and disease.

Figure I-19 shows the RST diagram for this text.

I.11.3 Joint

The Schema called JOINT has no corresponding relation. The schema is multinuclear, and no relation is claimed to hold between the nuclei. See the discussion in Section 2.3.

We illustrate the use of the JOINT schema with this notice from the UCLA Personnel News:

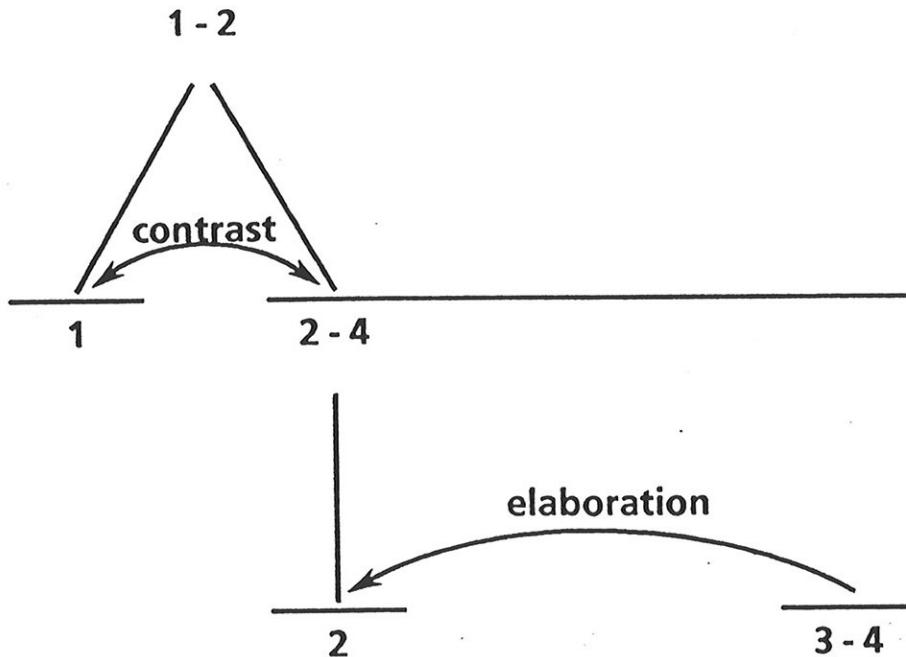


Figure I-19: RST diagram for "Compartmentalization" text

1. Employees are urged to complete new beneficiary designation forms for retirement or life insurance benefits
2. whenever there is a change in marital or family status.
-
- 5A. Employees
6. who are not sure of who is listed as their beneficiary
- 5B. should complete new forms
7. since the retirement system and the insurance carrier use the most current form
8. to disburse benefits.

This text, from which two units of detail have been omitted, essentially issues two different exhortations, one to employees who might have undergone a change in marital or family status, the other to employees who might have forgotten their listed beneficiary. These two parts are unrelated, except that they appear in the same text by virtue of shared subject matter; that is, they have no rhetorical relation to each other. Thus, a JOINT schema, illustrated in Figure I-20, accounts for them.

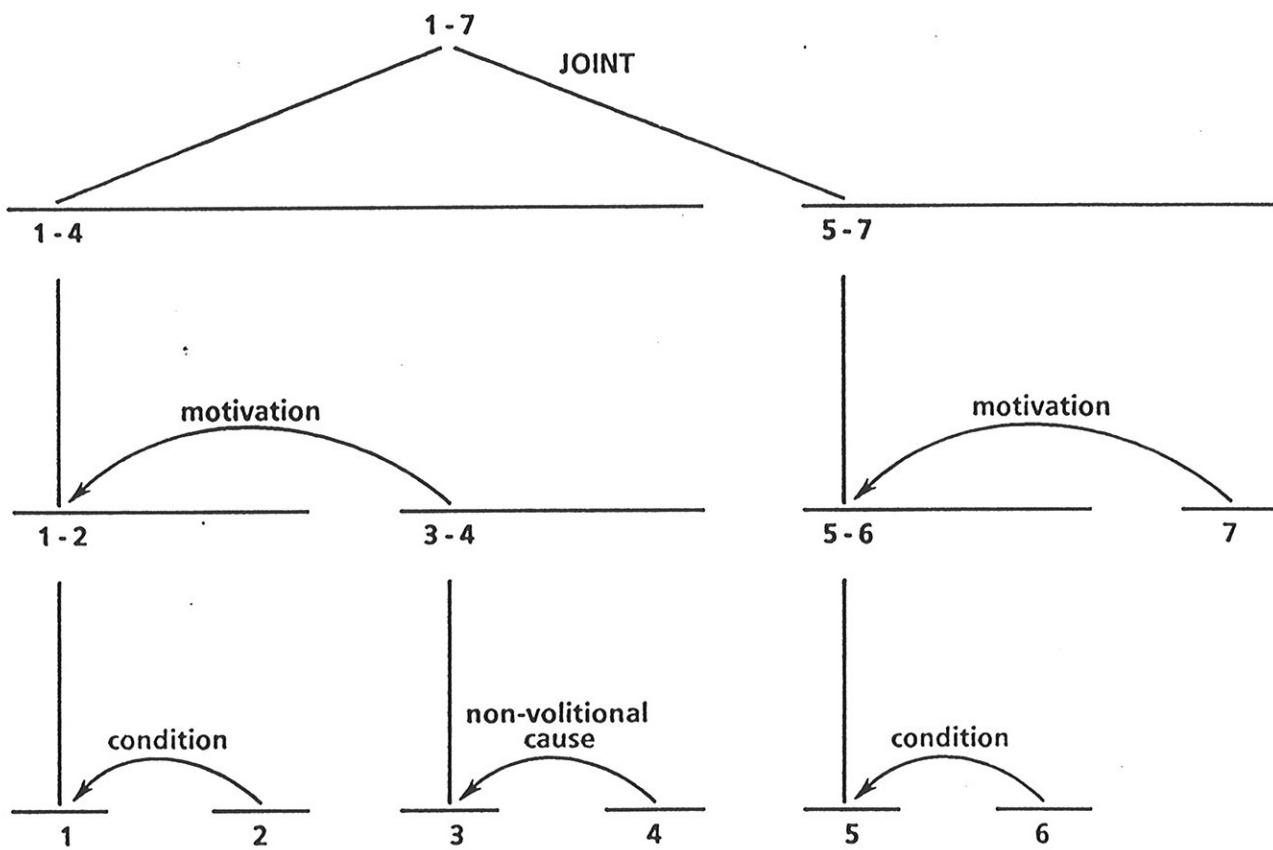


Figure I-20: RST diagram for "Beneficiary" text

In this section we have presented the relations found most useful in the analyzing short expository texts in our corpus. We have defined each relation and endeavored to provide enough detail to enable others to apply RST to the analysis of other texts.

II. Appendix: Terminology for the Definitions

To avoid misunderstanding of the definitions, this section covers some of their terminology and underlying assumptions.

II.1 Presenting and Expressing

Several terms that describe the process of writing are worth some comment. One group of these -- present, claim, express -- describes presentation of particular parts of the subject matter, which take various roles in the definitions. These terms cover more than just explicit mention of particular parts of the subject matter. They include ideas expressed indirectly, whether by indirect speech acts or other sorts of indirectness, and ideas evoked but not mentioned.

II.2 Knowing and Regarding

Text structures reflect methods of persuasion, argumentation and other manipulation of belief. The relation definitions reflect this by referring to concepts of belief and knowing and, more generally, to concepts of how the reader and writer regard particular ideas.²⁴

One could adopt one of several basic assumptions about how texts affect belief. The simplest is determinate and binary: For each person and idea, the person either believes the idea or doesn't at each relevant moment (e.g., before reading, after reading), and the text changes belief in a predictable and certain way. A slightly more complicated approach is probabilistic and binary: The text changes the likelihood of belief.

We have couched the relation definitions in terms of a third assumption, in which belief is treated as a degree concept. People believe with degrees of conviction; texts manipulate this degree. The notion is like Perelman's "adherence of mind" [Perelman & Olbrechts-Tyteca 69].

This notion is more realistic about what texts actually do and gives a direct way of accounting for certain text phenomena, such as presentation of multiple lines of evidence. However, those who prefer binary belief or a probabilistic basis can restate the definitions, perhaps without seriously changing the resulting claims about text function.

The degree approach applies to other concepts such as approval and urging to act as well as to belief. In some of the definitions, a general notion of **regard** for an idea, spans belief, approval and desire. The term **positive regard** employs this notion.

²⁴The term knowledge is treated separately, not simply as an aspect of knowing.

We use the new technical term **positive regard** to bring together under single definitions a number of very similar text relations. In the definition of the **Antithesis** relation, for example, it encompasses several ways of favoring one notion over another. In analyzing any one text span and decomposing it into parts, we apply a single primary notion of positive regard -- belief, approval, or desire -- depending on the analyst's perception of the writer's intent.

II.2.1 Situations and their Realization

"Situation" here is an explicit cover term that includes events, actions, and states, as well as various other elements of text subject matter. Situations can be either "realized" or "unrealized". Unrealized situations are imagined or have yet to exist. A realized situation is anything else, any other sort of subject matter. The important definitional consequences involve the unrealized situations.

II.2.2 Action

"Action" applies to text subject matter, and refers to activity on the part of some agent capable of volition. It appears in two definitional contexts: in **Motivation** and **Enablement**, to restrict the nuclei to things reasonably motivated or enabled, and in the Cause cluster, in distinguishing volitionals from the rest. Its scope includes acts of accepting offers, as well as refusing or avoiding acts.

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