Rethorical Structure Theory: Toward a functional theory of text organization

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Rhetorical Structure Theory: Toward a functional 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. The paper also examines three claims 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.[1]

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

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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 or multilogue.[2]

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 and Thompson, 1988; Thompson and Mann, 1987; Thompson and Mann, 1986; and Stewart, 1987).

Second, descriptive RST has been used as an analytical tool for a wide range of text types. Noel (1986), for example, shows how it can be used to characterize news broadcasts. Fox (1987) 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, 1985) is an example.

Fourth, RST has proven also to be useful in analyzing narrative discourse. Kumpf (1986) is a study of the interlanguage of Japanese and Spanish speakers. The author shows that RST is valuable in describing the grammatical and rhetorical properties of the narratives produced by these speakers.

Finally, RST provides a framework for investigating Relational Propositions, which are unstated but inferred propositions that arise from the text structure in the process of interpreting texts (see Section 7.2 and Mann and Thompson, 1986b). Since the coherence of a text depends in part on these Relational Propositions, RST has been useful in the study of text coherence.

In the unabridged version of this paper there is an extensive section describing the relationships that RST holds with other research, much of which has influenced it. Relationships with the work of Beekman, Callow, Kopesec, Longacre, Grimes, Crothers, Winter, Hoey, Meyer, Hobbs, Pike, McKeown, Paris, Grosz, Sidner, Martin, Halliday, Hasan and Jordan are discussed.

We presume of the reader no prior familiarity with RST. The intended audience is linguists and others familiar with common linguistic terminology. Our method is to define the symbolic mechanisms of RST and then to present their application along with natural examples. Those most interested in the consequences and content of actual analyses can skip Section 2 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 the four kinds of defined objects of RST: 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. *Relations*

Relations are defined to hold between two non-overlapping text spans, here called the *nucleus* and the *satellite*,[3] denoted by N and S.

A relation definition consists of four fields:[4]

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.

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, has knowledge of the context in which it was written,

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.

2.3. *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.

2.4. *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 as parts of their host clause units rather than as separate units.

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

completedness: 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 to 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 the Appendix. A major goal of this paper is to convey the definitions of these relations. There are, no doubt, other relations which might be reasonable constructs in a theory of text structure; our list includes 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, 1986.

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.

The definitions do not rely on morphological or syntactic signals. Recog-

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	

nition of the relation always rests on functional and semantic judgements alone. So, for example, recognition of a **Condition** relation does not depend on the presence of 'if'. We have found no reliable, unambiguous signals for any of the relations.

In the relation definition sections, here and in the Appendix, each relation definition is accompanied by a natural example of its occurrence. In this section, there are analyses of each example. There are RST structural analyses of all of the example texts in the extended version of this paper (Mann and Thompson, 1988).

Despite our efforts to say the opposite, some have interpreted 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.

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 W[7]
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
3. 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.

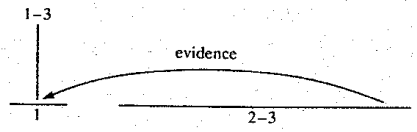

Figure 2. *RST diagram for 'Tax Program' text*

3.1.2. *Justify*

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

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.

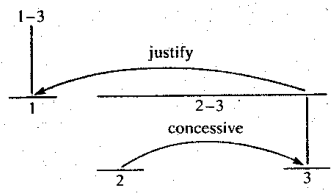

Figure 3. *RST diagram of 'Music Day' text*

For another example of **Justify**, an analysis of a text containing 'Let's be clear', see the Common Cause text analyzed in detail in Mann and Thompson (1986b); Mann and Thompson (1985); and Thompson and Mann (1987).

3.2. *Antithesis and Concession*

These two relations in the **Antithesis/Concession** subgroup share the following property: that 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*

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) 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

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

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.

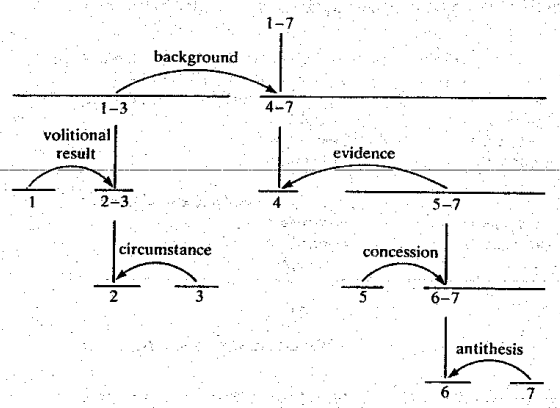

Figure 4. *RST diagram for 'Not Laziness' text*

3.2.2. *Concession*

One obvious way to signal a **Concession** relation is an 'although' clause (but see Thompson and Mann, 1986, for discussion of the form-function relationship with **Concession**). Here is a clear example in a *Scientific American* abstract:

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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 that 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

Title: Dioxin[8]

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.

In this text, the writer signals that Units 2 and 3 are compatible and acknowledges their potential incompatibility. That is, toxicity of dioxin 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.

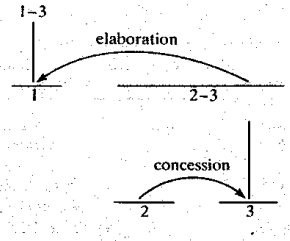

Figure 5. *RST diagram for 'Dioxin' text*

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

6. Effects and functionalism

An essential part of a relation definition is the section labelled Effect. It contains a statement of some condition that is routinely achieved through the 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 an inappropriate use of relations.

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.[10]

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

Up to this point, the paper has been devoted to defining and exemplifying the conventions, methods and mechanisms of RST; it has not focused on research results. Here we review some results of applying RST constructs to natural texts.

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

7.1. *Results from text analysis*

A key feature of the definitional sections above is that they do not force texts to 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. In fact, there are so many constraints on RST structures that it is somewhat surprising to find that so many texts have RST structural analyses. If just a few of the defined relations were undefined, or if people would wander from topic to topic, or if the effects of various relations were misstated in definitions, then many texts would have no assignable structure.

At this time of 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 and Thompson, 1986b; Mann and Thompson, 1985).

These relational assertions have several unusual properties:

1. They are not necessarily 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 struc-

ture 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. Take, for example, the text diagrammed in Figure 2:

1. The program as published for calendar year 1980 really works.
2. In only a few minutes, I entered all the figures from my 1980 tax 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 the 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 these aspects of relational propositions have been recognized in prior work. The new element in this paper is that relational propositions are seen as being 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 and Thompson, 1986b), and also discussed it in Thompson and Mann (1987). It is an advertisement for computer diskettes from '*BYTE*' magazine.[11]

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 Syncom diskette is working four ways
5. to keep loose particles and dust from causing soft errors, drop-outs.
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.[12]

13. To see which Syncom 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. Syncom, Box 130, Mitchell, SD 57301. 800-843-9862; 605-996-8200.

The RST analysis of this text appears in Figure 6. We will not discuss each part of the analysis in detail, but will outline its central claims for the overall structure of the text.

Figure 6 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 6, 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'.

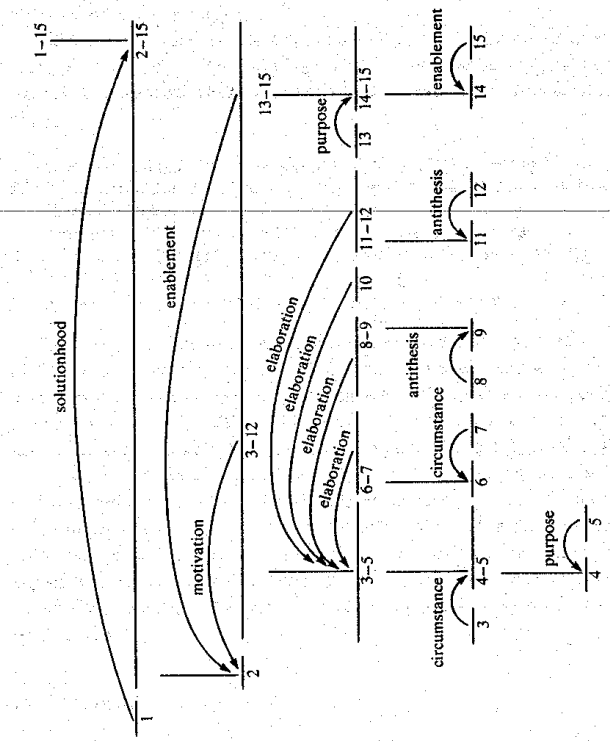

Figure 6. *RST diagram for 'Syncom' text*

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 incomprehensibly 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.[13]

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 by-product of recognition that a particular relation holds. (The only exceptions are in the cause and result relations.)

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.

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 (diagrammed in Figure 8), 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.

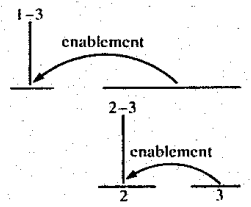

Figure 8. *RST diagram for 'Tech Reports' text*

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 of this prediction against the Syncom text strongly confirms our prediction. Figure 6 shows that the following units are nuclear within some schema in the RST analysis:

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 Syncom diskettes and gives information motivating and enabling us to do so.

In stark contrast is this 'text', which consists of those units in the Syncom 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, drop-outs
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 Syncom 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 cannot 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. *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 and Thompson (1988). 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.

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 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 (1983).

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 to the extent 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 judgements of linguistics, has its obscure and borderline cases, but grammaticization 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 effect 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. Conclusions

The definitions in this paper provide a specific and examinable interpretation for an RST structural analysis. They identify the sorts of facts and judgements 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.

Appendix

More relations

All the relations named in Table 1. have been defined in the style described above. In the larger version of this paper, all the definitions are given, exemplified and discussed (Mann and Thompson, 1988). Because of space limitations, this section presents a much more limited treatment. The definitions are presented with only occasional brief discussion. Since, for many readers, the natural examples have the status of *data* rather than just exposition, the examples which were used to illustrate the relations are also presented, but without unit division or analysis. The 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.

Circumstance

constraints on S: S presents a situation (not unrealized)
Constraints on the N + S combination: S sets a framework in the subject matter within which R is intended to interpret the situation presented in N
the effect: R recognizes that the situation presented in S provides the framework for interpreting N
locus of the effect: N and S

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

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

Solutionhood

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

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

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

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

It thus compares to Grimes' Response predicate (Grimes, 1975).

Elaboration

constraints on the N + S combination: S presents additional detail about the situation or some element of subject matter which is presented in N or inferentially accessible in N in one or more of the ways listed below. In the list, if N presents the first member of any pair, then S includes the second:
1. set : member
2. abstract: instance
3. whole : part
3. process : step
5. object : attribute
6. generalization : specific

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

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

Background

constraints on N: R won't comprehend N sufficiently before reading text of S
constraints on the N + S combination: S increases the ability of R to comprehend an element in N
the effect: R's ability to comprehend N increases
locus of the effect: N

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

Enablement

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

Text Example: '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.'
. . .
For a catalog and order form write to WIOES, 2520 Milvia St., Berkeley, CA 95704.'

Motivation

constraints on N: presents an action in which R is the actor (including accepting an offer), unrealized with respect to the context of N
constraints on the N + S combination: comprehending S increases R's desire to perform action presented in N
the effect: R's desire to perform action presented in N is increased
locus of the effect: N

From a personal message on an electronic bulletin board:
Text Example: 'The Los Angeles Chamber Ballet (the ballet company I'm dancing with) is giving 4 concerts next week . . . Tickets are $7.50 except for the opening night . . . The show is made up of new choreography and should be very entertaining. I'm in 3 pieces.'

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

Volitional Cause

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

Text Example: 'Writing has almost become impossible so we had the typewriter serviced and I may learn to type decently after all these years.'

Non-Volitional Cause

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

From an institutional advertisement:
Text Example: '. . . we've been able to mine our own iron ore, coal, manganese, dolomite, all the materials we need to make our own steel. And because we can mine more than we need, we've had plenty of manganese and iron ore for export.'

An abstract from *Scientific American*:
Text Example:

'The Transfer of Technology to Underdeveloped Countries

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

Volitional Result

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

Two examples from one personal letter:
Text Example: '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.'

Text Example: 'Writing has almost become impossible so we had the typewriter serviced and I may learn to type decently after all these years.'

Non-Volitional Result

constraints on S: presents a situation that is not a volitional action
constraints on the N + S combination: N presents a situation that caused the situation presented in S; presentation of N is more central to W's purposes in putting forth the N-S combination than is the presentation of S.

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

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

Purpose

constraints on N: presents an activity
constraints on S: presents a situation that is unrealized
constraints on the N + S combination: S presents a situation to be realized through the activity in N
the effect: R recognizes that the activity in N is initiated in order to realize S
locus of the effect: N and S

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

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

Condition

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

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

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

From an administrative memo on an electronic bulletin board:
Text Example: 'It's new brochure time, and that means a chance for new project write-ups. Anyone desiring to update their entry in this brochure should have their copy in by Dec. 1. Otherwise the existing entry will be used.'

Interpretation

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 regard
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

Text Example: '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. Such a decline is highly unusual at this stage in an expansion;'

Evaluation

constraints on the N + S combination: S relates the situation in N to the 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

From an advertisement:
Text Example: 'Features like our uniquely sealed jacket and protective hub ring make our discs last longer. And a soft inner liner cleans the ultra-smooth disc surface while in use. It all adds up to better performance and reliability.'

Restatement

constraints on the N + S combination: S restates N, where S and N are of comparable bulk
the effect: R recognizes S as a restatement of N
locus of the effect: N and S

Text Example: 'A WELL-GROOMED CAR REFLECTS ITS OWNER
The car you drive says a lot about you.'

Summary

constraints on N: N must be more than one unit
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

Text Example: 'For top quality performance from your computer, use the flexible discs known for memory excellence.

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

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.

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

Sequence

constraints on N: multi-nuclear
constraints on the combination of nuclei: A succession relationship between the situations is presented in the nuclei[14]
the effect: R recognizes the succession relationships among the nuclei.
locus of the effect: multiple nuclei

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

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 being made
locus of the effect: multiple nuclei

An abstract from *Scientific American*:
Text Example: 'Animals heal, but trees compartmentalize. They endure a lifetime of injury and infection by setting boundaries that resist the spread of the invading microorganisms.'

Joint

The schema called JOINT has no corresponding relation. The schema is multinuclear, and no relation is claimed to hold between the nuclei.

Text Example: 'Employees are urged to complete new beneficiary designation forms for retirement or life insurance benefits whenever there is a change in marital or family status.
. . .
Employees who are not sure of who is listed as their beneficiary should complete new forms since the retirement system and the insurance carrier use the most current form to disburse benefits.'

Notes

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1. We have been developing RST over recent years at the 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 discussions of RST and text generation, see (Mann, 1984) and (Mann and Thompson, 1986a), and for somewhat less technical presentations of RST as an anlytical tool see (Mann and Thompson, 1985) and (Mann and Thompson, 1987). Authorship of this paper is shared equally.
2. For applications of RST to spoken language, see (Kumpf, 1986) and (Stewart, 1987).
3. The terms are simply span labels here; in Section 10 they are described and justified as appropriate labels. In Mann and Thompson (1988), an unabridged version of this paper, the definitional uses of the following terms are discussed: nouns **text span**, **reader**, **writer**, **analyst**, **action**, verbs **to present**, **express**, **claim**, **know**, **regard**, **believe**, and adjectives **realized** and **unrealized**.
4. In the definitions, the 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.
5. Plausibility is a threshold concept, based on a degree scale and a conventional way of dividing the scale to provide a binary judgment.
6. In some of the definitions, a general notion of **regard** for an idea, spans belief, approval and desire. 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.

7. In 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 judgements 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.
8. We 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.
9. We note that this distinction is reminiscent of, but not the same as, Halliday and Hasan's distinction between 'external' and 'internal' relations (Halliday and Hasan, 1976; Martin 1983; and Noel, 1986).
10. Of course, it is not the whole functional account; many effects of a text do not depend on its RST structure.
11. From an advertisement by Syncom appearing in the June, 1982 issue of BYTE magazine. Copyright © 1982 Byte Publications, Inc. Used with permission of BYTE Publications, Inc.
12. Our analysis of this infinitival clause as part of Unit 11, rather than as a separate unit, derives from the judgement 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.
13. This is always a matter of judgement, but is 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.
14. Note that the definition does not cover presentational sequence, e.g., 'First . . .; Second . . .' See the discussion of presentational relations in Section 5.

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