The Role of Global Structures and Local Relations in Text Generation : A Contrastive Study*

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ABSTRACT

Global discourse structures and local discourse relations are complementary modes of textual organization which an automated text generation system must account for and treat as interactive knowledge resources. To illustrate this interaction, we analyse a medical case report in terms of the two approaches. The results of the analysis will help to show how both kinds of structures are necessary for descriptive and text generation purposes.

1 Introduction

As users and receivers of a language, we produce texts whose communicative function has to be interpreted in terms of the concrete situation in which they were produced. And even though human communication takes place in instantial situations which are unique and non-repeatable, in many occasions communication is possible because we have internalized our knowledge of what can be called a generic situation, which is an abstraction of similar instantial situations. Following Gregory (1988: 304), we can say that a generic situation is a complex configuration of experience relationships, interaction relationships, and medium relationships, which together provide a complex communicative function for the generic situation. The meanings associated with specific social situations find their expression in texts, which are constructed for specific purposes by their speakers. It is from the conventionalized forms of such situations that genres arise.

This explains the emphasis given in genre studies to the study of texts as a whole, both as products and as interactive processes: genres are both 'products' and 'processes', -'systems' and 'performances'. Each time a text is produced so as to realize and construct a situation-type it becomes the model for another text and another situation-type. As a model, it functions like a static, finished product or a system according to which new texts can be constructed. Once the constructing begins it becomes again a dynamic process, a 'performance' which will inevitably change the model with which it begins. This means that we have to teach "the interpersonal and textual characteristic of genres, the probabilistic, dynamic aspects of their performance as well as their schematic structure" (Threadgold 1989:100).

In this paper the concept of genre will be distinguished from the notion of register, the latter being frequently used to refer to sections within a text which are characterized by certain linguistic forms. This distinction will allow us to account for the hybrid nature of texts, where certain sections of a text show characteristics which are not shared by the text as a whole. The correlation between register and genre will be studied in section 3, where a framework for generating generic structures from choices in the register network is proposed. But before that, we will present a brief overview of the most influential approaches to the modelling of generic structures.
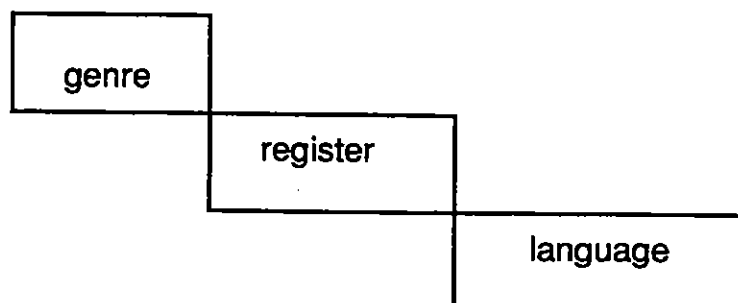
2 Review of relevant literature

Several approaches to global or generic discourse structures have been proposed: in linguistics, these structures have always been associated with conventional stages or a stereotypic genre. Van Dijk (1980) proposed the notion of superstructures to account for the overall form of a discourse. Superstructures are, according to him, schemata with a fixed, conventional nature for each type of text. Unfortunately, the model he developed for generating superstructures does not explain variation in the texts which belong to the same type, and does not go beyond hypothesizing that a transformational-generative sentence analysis model can also be applied to the analysis of generic structures.

In computational text generation, the so-called schemas, first developed by McKeown (1985), capture the stereotypical arrangement of clauses in common expository texts such as descriptions of objects.

Within the systemic-functional framework, the most important attempt at modelling global structures is Hasan's Generic Structure Potential (Hasan 1984). Her Generic Structure Potential (GSP) sets out to build in "the possibility of text variation from the start" . Her hypothesis is that the values of the dimensions of field, tenor and mode, which together configure the register to which a text belongs, also determine the global patterning of texts. Within this global patterning, some elements will be obligatory, functioning as realizations of a given generic potential, others will be optional, adding variation to the global patterns of realized texts in a genre.

More recently, J. Martin (1985, 1992) has proposed a slightly different view on the relationship between register and genre. Starting from Hjelmslev's idea of connotative semiotics, i.e., a semiotic whose expression plane is another semiotic system, Martin distinguishes register and genre as two semiotic systems stacked up against language, where genre is realized by register and register by language, as in Figure 1 below:

Figure 1: Language in relation to its connotative semiotics:
register and genre (adapted from Martin 1985)

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┌──────────────┐
│              │
│  genre       │
│          ┌───┴──────────┐
└──────────┤              │
           │  register    │
           │          ┌───┴──────────────┐
           └──────────┤                  │
                      │   language       │
                      │                  │
                      └──────────────────┘
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According to him, genre is a term used to embrace "each of the linguistically realized activity types which comprise so much of our culture"; genres are "how things get done, when language is used to accomplish them" (Martin 1985: 250). Genre is, for him, an abstract category which represents the verbal strategies used to accomplish social purposes of many kinds. These verbal strategies are the stages through which one moves when realizing a genre. For example, in narrative of personal experience (Labov and Waletzky 1967), one begins with an Abstract, continues with an Orientation, follows on with a Complication, carries on with a Resolution, and ends with a Coda. Martin calls these structures schematic structures -equivalent to Hasan's generic structures-, and defines them as ways used by a given culture to accomplish a given genre.

The difference with Hasan's generic structures lies in their origin. For Hasan, schematic structures are generated by options deriving from the field, the tenor and the mode of discourse. For Martin, by contrast, the elements of a generic or schematic structure should be generated by genre networks, and will, in their turn, preselect particular values of field, tenor and mode in the register network. But, as he himself acknowledges, this is just a purely descriptive methodology; the direction of determination does not seem important as long as we can establish a correlation between the values of register and generic structure (Martin 1985: 252).

Other approaches to genre modelling have also been proposed in the systemic literature, like the Birmingham Discourse Analysis Model (Sinclair and Coulthard 1975) work on teacher- pupil talk in classroom interaction, and the work of other researchers concerned with the structure of the exchange (Burton 1980; Berry 1981). Also, work concerned with modelling social processes

dynamically has been proposed by Ventola and others (Ventola 1987; Murray 1987; Fawcett et al. 1988). However, most of this work is oriented towards dialogue, not being, therefore, relevant for the discussion of global discourse patterns in monologue with which we are concerned in this study.

    We will adopt in the next sections an approach to schematic patterning which can be seen as a combination of Hasan's and Martin's proposals to the study of genre. It is our feeling that a sensible way to relate the concepts of register and genre is precisely by postulating that the values resulting from the choices made from the field, tenor and mode parameters determine the elements of the generic structure, which might then linguistically realized in different ways in the lexicogrammar. This allows for internal variation within the same text: different sections of a text might show different lexicogrammatical realizations, thus allowing for different 'registers' accounting for different sections of the same text (Birch and O'Toole 1988).

3 Generic Structure Potential : Theoretical Considerations

    In dealing with the generic structure of texts, we propose to enquire about two main questions:

1.- The origin of the elements of a generic structure
2.- The question of genre agnation, i.e., genre as a system.

With respect to the first question, and following Hasan, we would favour the view according to which the elements of a generic structure are derived by specific choices at the level of register. Furthermore, the generic structure exhibited by one specific genre (a nursery tale, a case report, a recipe) is not just one single structure, but is part of family of related generic structures, the Generic Structure Potential of that particular genre.

> *The Generic Structure Potential is descriptive of the total range of textual structures available within a genre G. . . . It is important to underline the fact that the GSP is a statement of the structural resources available within a given genre.* (Hasan 1984: 74)

This means that GSPs are delicacy variable and agnate with other GSPs. For example, recipes are just one type of procedural texts and there are subvarieties of recipes; and within the general family of procedural or instructional texts, and depending on the degree of delicacy, we can expect certain GSP elements to hold still. For example, most instructional texts will tend to include an obligatory Method element (this element can be found in recipes as well as in manuals, for example). In more specific types of recipes one can find elements specific to subtypes. For example, we find an element of Cultural comment in recipes describing dishes from a cuisine foreign to the reader, or an element of Nutritional value in recipes concerned with dieting. Reports, for example, will tend to include a narrative element - which will receive different names according to the field- and which will unmistakably make the reader classify the text as a report, and not as a procedure.

As an illustration, we propose a provisional library of GSPs for the genre of reports. We only present the generic structures of some types of reports, namely, medical case reports, law reports and news reports. The proposed GSPs for these three categories are based on corpus analysis of a limited range of texts belonging to those categories. What follows, therefore, by way of formalization is intended only as an illustration of what a GSP library for the chosen genres might entail. It is our hope that as the study of genre unfolds, more GSP libraries will develop for different genres. For the purposes of this paper, however, we only intend to offer the theoretical framework for the study of generic structures which might guide further research on this area in the future. Figure 2 below illustrates a provisional GSP library for three kinds of reports:

Figure 2: Provisional GSP library for three kinds of reports
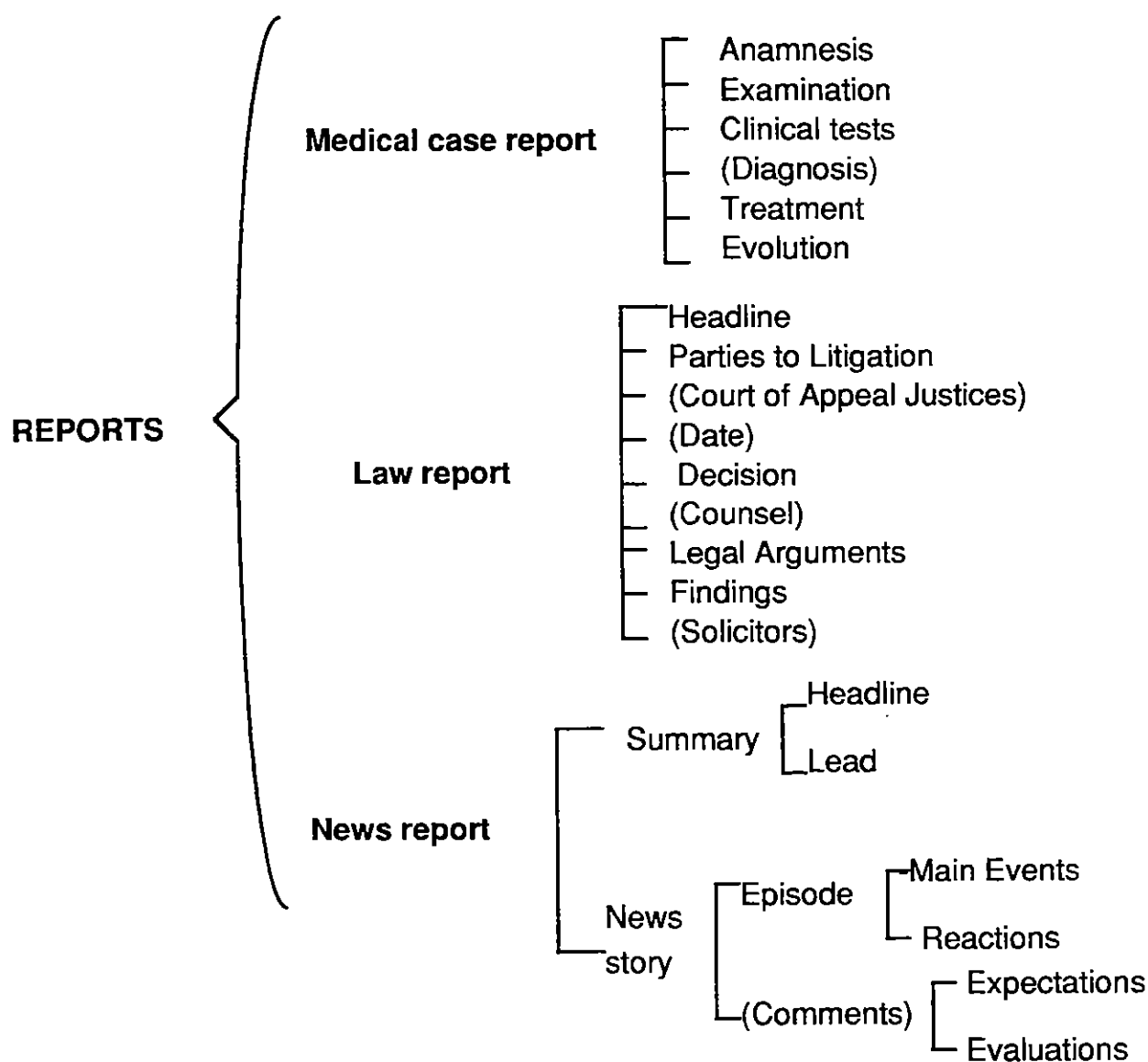
In the next section we will show how the elements of the generic structure of a medical case report can be generated by choosing different values by selecting different values from field, tenor and mode from the register network, and how each of the elements of the generic structure of the text is realized by different patterns of lexicogrammatical selection which, in most cases, reflect a different communicative purpose.

But before doing that, let us return to the second issue: the question of genre agnation, genre as a system. There are not many existing descriptions in this area, except for the recent work of Martin on factual genres. His proposal derives a range of factual genres from two simultaneous system networks which organise the genres as a synoptic meaning potential, as shown in Figure 3 below:

Figure 3: Agnation among a range of factual genres
(adapted from Martin 1993)
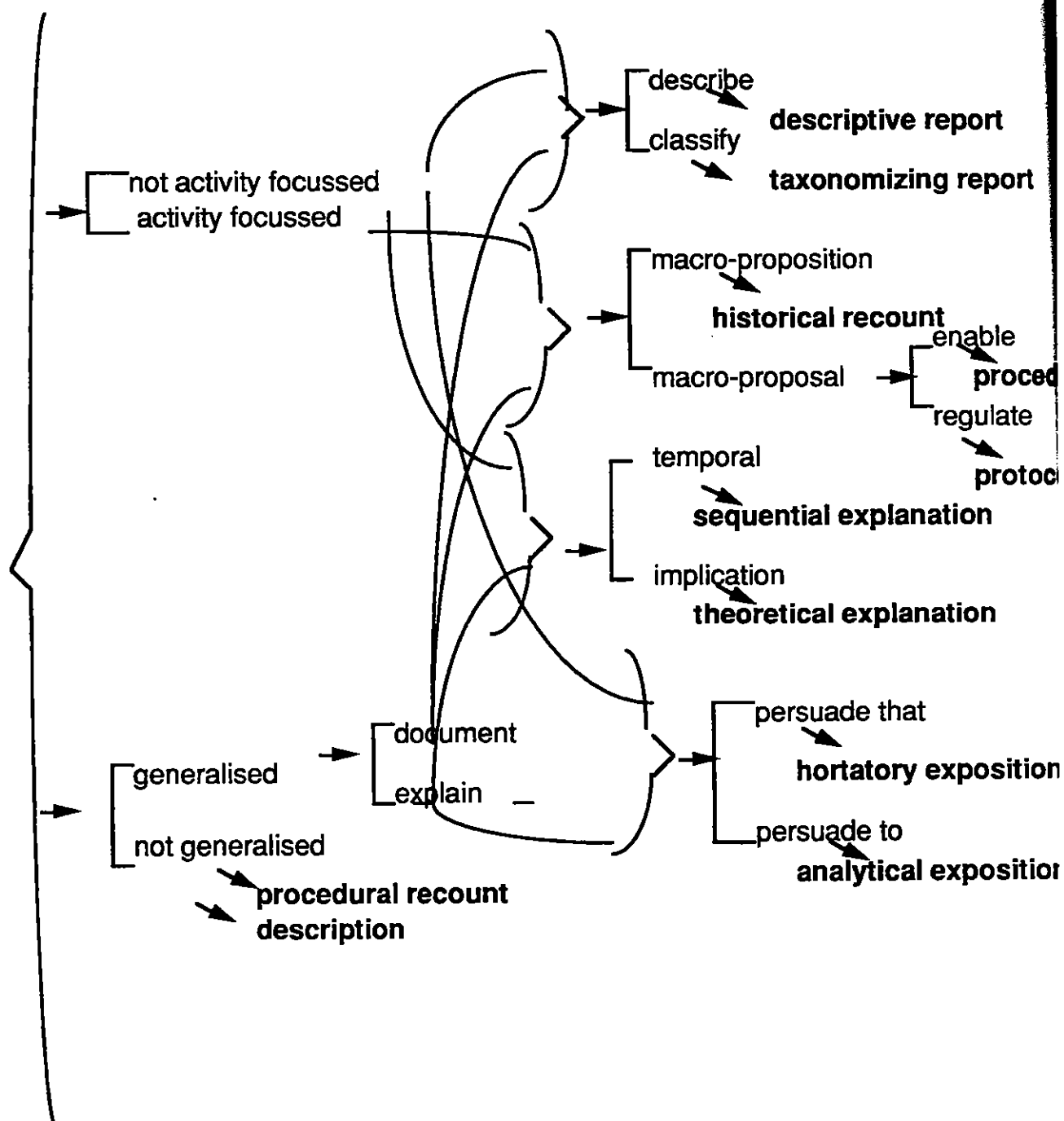
Obviously, the network is intended only as an illustration of what genre as system might entail. The idea is to formalize genre as a "trans-metafunctional valeur", in Martin's words, as a semiotic system which goes beyond and independent from the values of field, tenor and mode.

We agree with Martin in saying that genre construes the social processes of a culture as a semiotic system, and that, as such, it represents at an abstract level "the verbal strategies used to accomplish social purposes of many kinds" (Martin 1985: 251). These strategies, which are realized as the stages through which one moves in order to realize a genre, we propose to capture in our preliminary GSP library. However, when having to generate the generic elements of text which are responsible for distinguishing different genres in a given culture, Martin's system networks did not offer sufficient guidance. It is our feeling that at this point we need to derive those elements from specific choices from the parameters of field, tenor and mode, as we will suggest in the next section. There we will focus on the generic structures of a sample text to illustrate the way in which its elements can be generated from options deriving from the field, the tenor and the mode dimensions of the communicative situation.

4 An example: a medical case report

CASE REPORT

ANAMNESIS

(1) A 40-year-old woman who worked as a pediatric nurse had been diagnosed in 1982 with chronic non A, non B hepatitis.
(2) From 1982 to 1988, she experienced numerous episodes of intense fatigue.

EXAMINATION

(3) Physical examination showed that the liver and spleen were not enlarged.

ANALYSIS

(4) The ALT level fluctuated between 1.6 and 4 ukat/L.
(5) Bilirubin and serum albumin levels and the prothombin were normal.
(6) Serum gammaglobulins were 26g/L.
(7) In 1988, antinuclear and antismooth-muscle antibodies were present at a titer of 1:50   and 1:200, respectively.
(8) Markers for hepatitis B virus infection were negative.
(9) First-generation ELISA done in January 1989 was negative for anti-HCV.
(10) Histologic examination of a liver biopsy specimen showed bridging fibrosis and abundant mononuclear infiltrates in the portal and periportal area.

TREATMENT

(11) On 2 February 1989, administration of alpha-interferon, 3MU thrice weekly, was begun.

EVOLUTION

(12) One month later, the patient complained of intense fatigue,
(13) and ALT levels progressively increased.

(14) On 10 April 1989, therapy with alpha-interferon was discontinued.

(15) One month after cessation of alpha-interferon therapy, the ALT level increased to 6.3 ukat/L and subsequently decreased.

(16) Second-generation RIBA, done on a serum sample collected in January 1989, was negative for anti-HCV.

(17) Antinuclear antibodies and anti-smooth-muscle antibodies were present at a titer of 1:100 and 1:200, respectively.

(18) No anti-LKMI antibodies were present.

(19) On 10 October 1989, a second liver specimen was obtained.

(20) Histologic examination of this specimen showed cirrhosis and marked piecemeal necrosis.

(21) On December 1989, prednisone was begun at a dose of 0.4 mg/kg

(22) and fatigue resolved within 3 weeks.

(23)The ALT level decreased to 1.3 ukat/L.

(Annals of Internal Medicine 116 (1): 50)

First, let us look at the generic structure of this case report. The text consists of different steps corresponding to the ordinary clinical history that doctors carry out on every patient that comes for consultation. Once they have collected all data in a patient's clinical history, they produce a case report for publication. The different elements of the generic structure of this case report are the following:

1.- Anamnesis (1-2): this element reflects what the patient tells the doctor, including previous diagnoses, treatments, if any, and symptoms of different kind reported by the patient to the doctor.

2.- Examination (3): this element reflects what the doctor observes during the physical examination of the patient.

3.- Analytical Tests (4-10): this element reflects the results of the reach the correct information obtained through the previous steps 1,2,3, the doctor hypothesizes a diagnosis, and proceeds with a suitable treatment.

5.- Evolution (12-23): this element is clearly recursive. The doctor, after administering a treatment, performs a series of revisions on the patient, to check whether she improves her physical condition. The revisions are performed following the same sequence of steps: anamnesis, examination, analyses, and treatment. In the case report, however, only those elements that the doctor considers relevant to be communicated to the scientific community are reported. This is the case in this report:

-(12-13): This element reflects the first revision carried out on the patient one month after treatment with alpha-interferon, and it captures a second anammesis (12: the patient complained of intense fatigue) and the result of new analyses (13: the ALT levels progressively increased)

-(14): this element reflects a second revision carried out in April, and it captures only the cessation of the treatment with alpha-interferon.
-(15 -18): this element reflects a third revision after the treatment was discontinued, and it captures new results from the different analyses.
- (19-20): this element reflects a fourth revision carried out five months later (October 1989), capturing the results of new analysis (a liver biopsy).
-(21): this element reflects a new treatment (with prednisone) started in a fifth revision.
-(22-23): this element reflects a 6th revision three weeks after the new treatment, capturing the results of the new anamnesis (fatigue resolved) and of the analysis.

To sum up, the text has the following generic structure:

Figure 4. Generic Structure of a Case Report
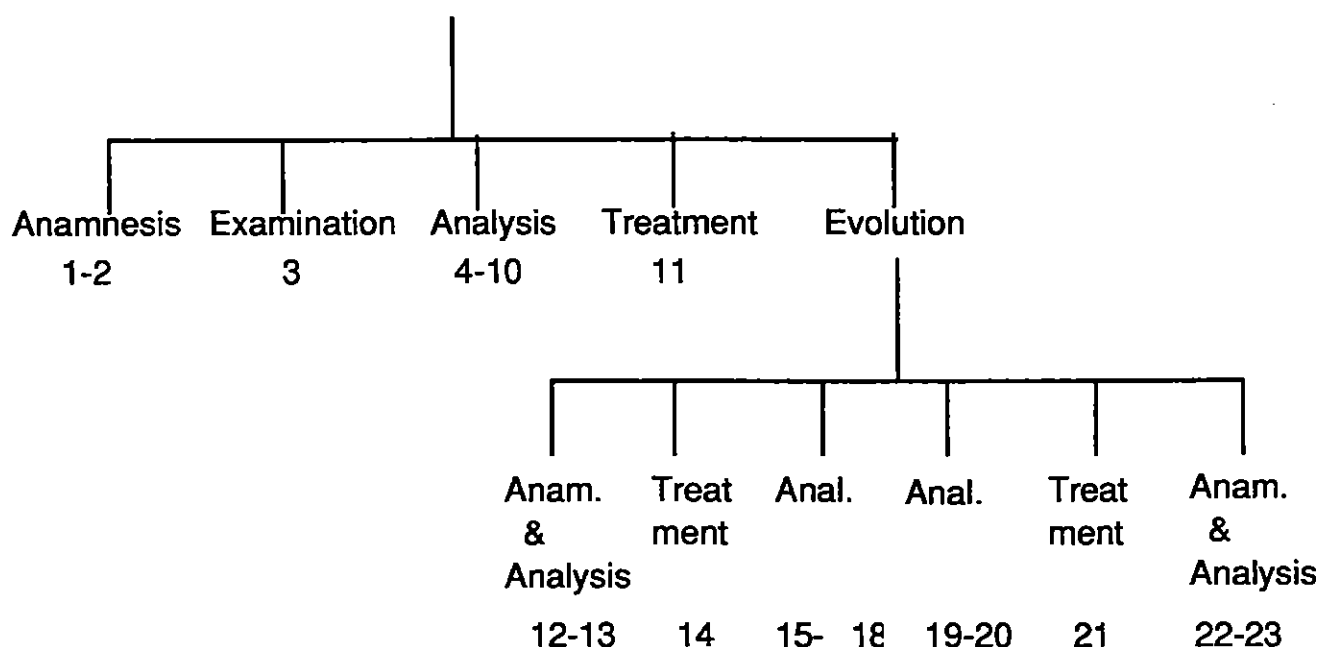
The case report is organized as a constituent structure of specific parts, the elements *Anamnesis, Examination, Analyses, Treatment* and *Evolution.*The element Evolution is recursive and selective: it tends to repeat some of the elements of the previous structure throughout several revisions in a temporal sequence. Only those elements which the doctor considers to be relevant for the patient's evolution are reported, although the whole sequence is performed in each revision. The generic structure is oriented toward the social context, and this specific structure helps identify the text unmistakably as a case report.

The question for generation is obviously the following: where do these elements come from? why is a medical case report structured according to the above mentioned stages and not to others? In section 3 above we suggested that it should be possible to derive a methodology for relating the generic elements of a text to options from the parameters of the context of situation with determine the register. Figure 5 below is an attempt at illustrating this: how by selecting certain values from the dimensions which configure a communicative situation, namely, field, tenor and mode, we can derive a register specification which will be responsible for generating a specific generic structure.

Figure 5. The situation type of a medical case report
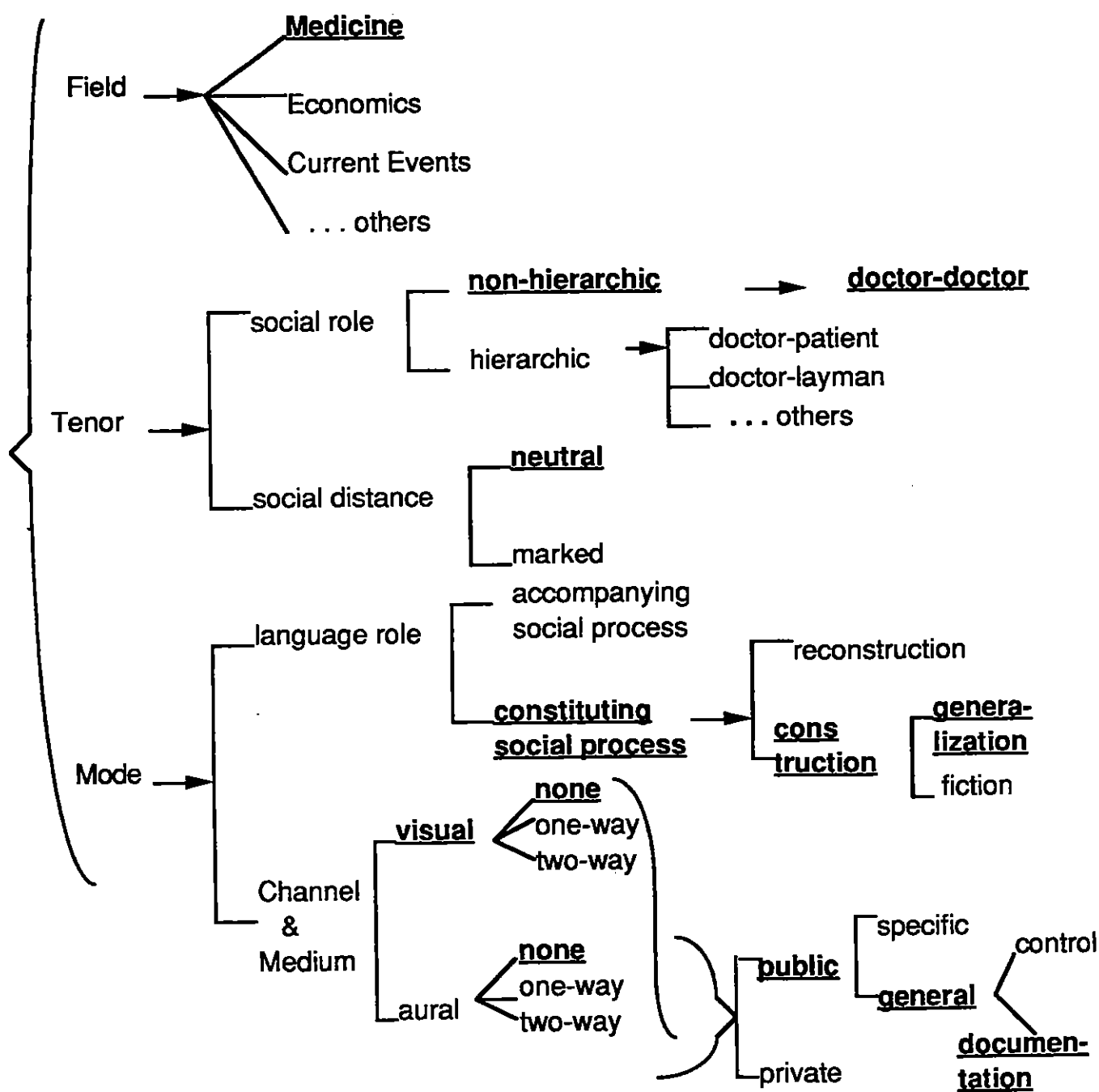
The configuration of options from the three simultaneous networks above (the values selected are boldfaced and underlined in the network) shows a provisional register specification which will help us characterize the text as a medical case report, and not a research

article, or a law report. The generic structure of an economic report, or of a law report, or of medical research article, to mention only a few, will result from different selections from the values presented above. The network above is illustrative only and intended to show a methodology for deriving the generic structure of a text taking the parameters of the communicative situation as the point of departure.

We can now turn to the *rhetorical structure* of the text in terms of local discourse relations.[1] The nucleus of the text is captured by the Treatment and Evolution sections. It is preceded by supporting background information, which introduces the past history of the patient (itself background information for the analysis) and the details of the examination and analysis performed before initiating a treatment with alpha-interferon. This background material is structured as a series of Joint steps (there's no other discourse relation among them) which capture the analysis performed on the patient. The nucleus is structured as a chronological sequence of seven steps which correspond to the six revisions carried out on the patient (*On 2 February 1989, on March 1989, on April 1989, on May 1989, on October 1989, on December 1989, and 3 weeks after that*). None of these steps is more or less nuclear. Figure 6 illustrates the analysis of the case report in terms of discourse relations:

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[1] Local discourse relations have been studied from a number of perspectives and received different names: rhetorical relations, coherence relations, discourse structure relations, etc... Researchers from several intellectual fields have produced lists of these relations -from philosophers (Toulmin, 1958) to linguists (Quirk and Greenbaum, 1973; Halliday, 1985; Mann & Thompson, 1988; Sanders et al., 1992; Redeker, 1990; Maier and Hovy, 1992; Hovy et al., 1992) to Artificial Intelligence researchers (Schank and Abelson, 1977; Dahlgren, 1988). Typically, their lists contain between five and thirty relations, and they argue that at least tens of interclausal relations are required to describe the structure of English discourse. In this paper we circumscribe our analysis to the relations proposed by Mann and Thompson (1988), since their approach is still the most influential in text generation.

Figure 6: Rhetorical structure analysis of a case report
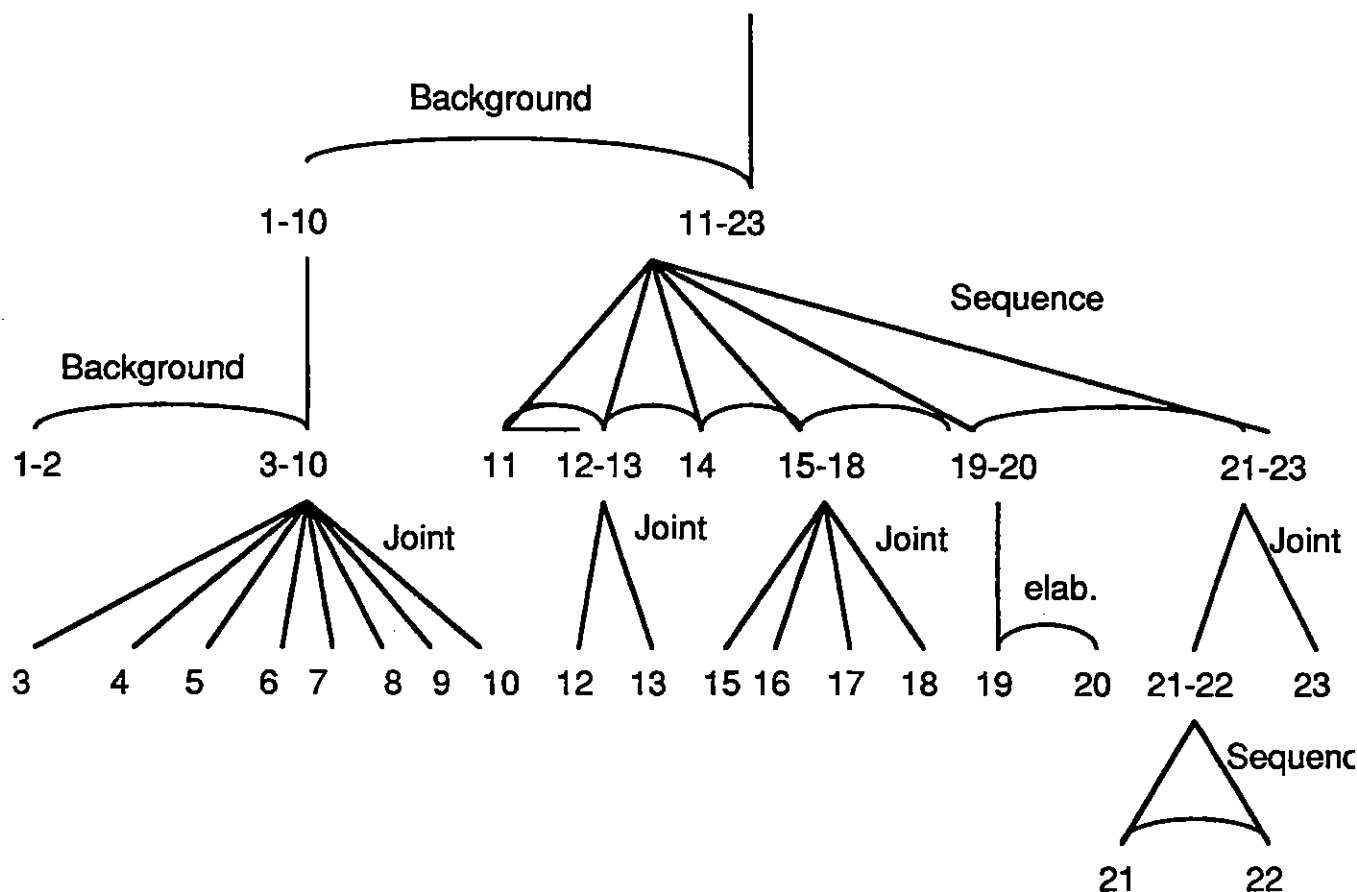
This analysis imposes an interdependency type of structure on the text with a predominance of relations such as *Background, Sequence* and *Joint*. However, these relations do not identify the text as a medical case report. As will be shown below in the analysis of the recipe, one can encounter the same relations relating spans of the recipe text. Discourse structure relations are, in theory, applicable to all varieties of text, and, therefore, they cannot be taken as definitory parameters for text classification: there is no indication in the structure of when the case report or the recipe have been completed. However, one can find certain tendencies in the use of certain sets of relations in a given register. For instance, the *Motivation* and *Enablement* relations are frequently found in advertisements, whereas the relation of *Elaboration* systematically recurs in encyclopaedic entries, and *Sequence* is always used in recipes.

By contrast, the labels of the generic structure of the text cannot be applied across different genres; they are defined in relation to a particular genre.

5 Generic Structures and Discourse Relations: General Comparison

This section will present a contrastive study of those aspects which form the basis for the differentiation of the two approaches to text organization illustrated above: their view of context and the type of structural realization characteristic of each approach. We start with the first aspect.

5.1 Context Orientation

The view of context that is responsible for the generic potential of texts draws on those features of the communicative situation which together configure the meaning potential associated with a *register*. The three components of the communicative situation which form the basis for register variation are *field, tenor,* and *mode*. And the combination of these parameters constitute different registers. Due to this view of context (which has its roots in the work of Malinowski and Firth) the approach to text organization provided by the generic structure of a text is based on a theory of register, and, accordingly, it gives a text a structure as a manifestation of the register(s) that produces it.

By contrast, the notion of context that is used by theories of local coherence does not rest on an ethnographic view of context, but on one which involves the mental state of the prospective reader. This is the case of the rhetorical relations provided by Rhetorical Structure Theory (Mann & Thompson, 1988), where a central component in the definition of any relation is the intended effect on the reader -that he/she recognizes, he/she comprehends, will desire to perform, and so on. For example, the intended effect that the reader's ability to perform an action (one of the mental states a text span my induce) is essential in the definition of the relation *Enablement* :

relation: ENABLEMENT
effect: the reader's potential ability to perform the action presented
in the nucleus increases

As we can see, discourse relations provide a functional organization of the text according to a view of context restricted to the specific instantial situation (Gregory,1988; Hasan 1985:102) in which the text is produced. Therefore, the approach provided by theories of local coherence operates with principles of organization that apply across genres and are not indicative of any one in particular.

5.2 Structural realization

Another dimension along which we can characterize generic structures is with respect to the type of structuring that it imposes on the text. Generic Structure operates with a constituency type of structure which focusses on the different parts of a text in relation to the whole. It specifies constituents, the labelled elements which signal the different steps in a specific genre. By contrast, the rhetorical structure imposes an interdependency type of structure, specifying relations holding between spans of text which can be used in any kind of text. The consequences of this difference are the following:

1.- The type of structuring that constituency imposes on the text does not exhaust the text in depth. In many registers, the elements of a generic structure tend to be iconic of the social interaction that is prior to text representation, and, accordingly, the indicate the function of a span of text in relation to the whole text. They account for the overall structure of text as a linguistic conventionalization of a social activity. This is one of the reasons why there is no sense of nuclearity in this type of organization. All the elements are equally important, so to say, for communicative purposes. As we will see, when we analyse conventional kinds of texts, as instances of specific register selections, the assignment of nuclear status (the writer's indication that the nucleus is more deserving of response, attention, deliberation or reaction) to one of the elements of a global structure, is not as straightforward as when we simply have two local text spans, where grammaticization of nuclearity in hypotaxis confirms it.

2.- The type of structuring that interdependency imposes on the text exhausts the text through internal nesting. Since the aim is to show the relation of one span of text relative to another, it follows that this type of structuring has to account for all the possible relations between text spans, and this produces internal nesting.

3.- Another difference between generic structures versus more discourse relations is in the different patterns of realization that each of the structures reflects. These realization patterns will all be the product

of the main contextual focus of the text; (descriptive, narrative, argumentative, etc.). However, there are differences in the patterns:

3.1.- Generic structures are normally realized differently according to the generic elements that characterize a certain type of text. In other words, the multivariate elements of a generic structure can be realized by different patterns of grammatical selection. This is because in many registers, each element of the generic structure can reflect a different communicative purpose (descriptive, narrative, argumentative, instructive, etc.) and, accordingly, the linguistic encoding changes. Why should this be so? As several linguistic studies have shown (Lavid 1993; Virtanen 1993) most texts are hybrid in nature, combining several communicative purposes. One should, therefore, be careful in applying too strict criteria in defining the borderlines between the different classes. What one deals with in the study of authentic texts is with dominances more than with pure text types. This fact permits the assignment of a given text to a particular category according to some overall pattern. But, in most texts, we find that each element of the generic structure shows a different pattern of *lexicogrammatical realization.*

Take, for example, the medical case report above. The element *Anamnesis* has a clear *narrative* purpose. A narrative text is characterized by the arrangement of actions and events in a particular order. This is reflected in the grammar by the selection of specific processes. In the Anamnesis section the processes are both Material (*worked, diagnosed*) and Mental (*experienced*) reflecting both the events that lead to the patient's present situation and the feelings that she experiences as a result of her illness. The patient is presented as the Actor a material process (*worked*), as the Goal of another one (*had been diagnosed*), and as the Senser of the Mental process (*experienced*). The circumstantial processes tend to encode the temporal nature of the event (*from 1982 to 1988*).

The *Examination* and *Analysis* elements, have a more *descriptive* focus, since their communicative goal is not to arrange actions or events in a temporal context, but to register phenomena. Hence the high amount of Relational processes (*liver and spleen were not enlarged, fluctuated, were normal, were 26gl., were present, were negative*, etc.) Also, the participant in the situation is removed from the scene, since the emphasis is no longer on the actions that a given participant may perform or undergo, but on the description of the result of the analysis. The participants in the relational processes are the analytical tests themselves.

These two goals further recur in the *Evolution* element, since, as we saw above, it is a recursive element which repeats the same

structure but reporting only the information that the doctor considers relevant for his audience.

If we now analyse the recipe, we will see a similar differentiation in grammatical patterns emerging out of the different elements that configure the text's generic structure. In the *Method* element, the Transitivity selections show a predominance of Material: action processes (*marinate, drain, brush, preheat, press, boil, salt,* etc.). The participants associated with those processes play the role of Goal in the actions described by those processes and are mostly inanimate and concrete (*lamb, liquid, stock*). The Mood selections are imperative throughout. However, the clause realizing the Preliminary Information element selects for indicative: declarative Mood (*Boneless, heart-shaped chops are pure bliss served with a fruity sauce*). The Transitivity selection is of a relational: ascriptive process: the dish is characterized according to the writer's subjective opinion, not acted upon.

3.2. The rhetorical structure of a text is also reflected in the lexicogrammatical realization. In the recipe text several text spans are realized as clause complexes, and in the case report theme development is guided by the method of development of the text. For example, in the Evolution section temporal themes are selected to bring out the points of the rhetorical development, e.g. the points of succession in this case.

6 Towards an integration

The two types of structuring discussed here offer two different perspectives on text organization. However, from the text planning point of view, they are not competing alternatives. On the contrary, given the need that text planning systems have for more robust, and stylistically adequate text generation, we see both approaches as complementary modes of text organization. The generic structure of a text resulting from the conventionalization of a generic situation may only be statable in generic terms, as has been illustrated in the examples above, where the characterization of these same texts only in terms of discourse relations obscures their similarities with other texts belonging to the same generic family. However, the internal organization of some of the elements of a given GSP might well be captured by more local coherence links. Discourse relations could then be regarded as strategies for realizing the elements of a generic structure. The degree of complementarity of both approaches will probably vary from genre to genre. We need, therefore, to analyse

more texts in terms of their generic structure, complemented with their analysis in terms of their coherence relations, to shed more light on the functions of these alternative approaches, this being, in our view, a necessary avenue of research for genre studies in the future.

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