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ABSTRACT

This article presents methods and results from diachronic studies of articles carried out within the project "LSP Texts in the 20th Century," a study of genre-bound linguistic change and variation in science and popular science in the fields of economics, medicine, and technology. The interrelationship between text and context is central for the general theoretical model within which the LSP studies at the cognitive, pragmatic, macrothematic, and microsemantic levels are carried out. Methods for cognitive and macrothematic analyses and results from the study of the superthematic structure of 90 articles within science and popular science are described. Findings point to clearer genre boundaries for the scientific text genre and homogeneity of the scientific articles. (Author/JP)

Message structure in LSP texts. A socially determined variation at different text levels.

BRITT-LOUISE GUNNARSSON

Abstract

This article presents methods and results from diachronic studies of articles from three fields carried out within the project 'LSP texts in the 20th century'. The interrelationship between text and context is central for the general theoretical model within which the LSP studies at the cognitive, pragmatic, macrothematic and microsemantic levels are carried out. The methods for cognitive and macrothematic analyses are described. Results are also presented from the study of the superthematic structure of 90 articles within science and popular science. The results are discussed in relation to hypotheses regarding a development during the 20th century towards clearer genre boundaries and firmer genre conventions.

1. Introduction

The relationship between text and context is essential for the text analyses within the research project 'LSP texts in the 20th century' which has been carried out at Uppsala University since 1986.[1] The theoretical frame is based on a synthesis between, on the one hand, text-linguistic theories and methods and, on the other hand, sociolinguistic theories. This means that texts within the project are studied as systems of linguistic structures that in different ways reflect society. It further means that linguistic change is studied and explained in relation to changes in society.

In this article, I will present our research programme focussing on how we try to grasp the interrelationship between text and context. I will discuss the more general theoretical model which is the basis for the text analyses within the project and then give two examples of how we, in our studies, try to grasp the correspondence between the text and its context. The first example focusses on the method of analysis (3), and the second one on the explanation of results (4).

2. The general theoretical model

The project 'LSP texts in the 20th century' has as its aim the study of genre-bound linguistic change and variation. We have analysed LSP texts of two genres, science and popular science, within the fields of economics, medicine and technology. The texts chosen are articles from three periods: 1895-1905, 1935-1945 and 1975-1985. Altogether, we have analysed 90 articles, that is around 7,500 standard pages, where standard means 3,000 characters per page.[2]

The goal of our text analyses is to describe synchronic variation and diachronic change on textual levels related to the message structure of LSP articles. Message structure is, of course, a multifaceted concept, and in this study of LSP articles, we focus more precisely on four dimensions of the message structure: the cognitive, pragmatic, macrothematic and microsemantic levels.[3]

To explain our choice of levels, I will turn to a brief presentation of the more general model for the correspondence between text and context which is basic for this LSP project.[4] The synchronic and diachronic analyses of texts within the project rest on a sociolinguistic basis, and the correspondence between context and text is, therefore, essential.

I distinguish between three types of context components: 1) *text-external* (situation, actor and function), 2) *intertextual* (genre), and 3) *intratextual* (text role and text means). These components are hierarchically organized; the text-external are above the intertextual and intratextual; situation is above actor and function, etc.

The context components can, in turn, be related to different text levels. I distinguish the following levels: *cognitive*, *pragmatic*, *macrothematic*, and *microsemantic*. The main assumed associations between component and level are the following:

Context	Text level
Text-external	
- Situation	Cognitive
- Actor	Pragmatic
- Function	Pragmatic
Intertextual	
- Genre	Macrothematic
Intratextual	
- Text roles	Pragmatic
- Text means	Microsemantic

The theoretical assumption in the LSP project is that texts systematically reflect changes in the contextual frame. This means that different types of changes in the contextual frame are assumed to be reflected at different levels. Figure 1 shows our assumptions of societal changes related to the different context components, and the text levels at which these changes can be assumed to be reflected. In Section 4, I will return to the hypotheses of changes related to the genre components, that is to changes assumed to be reflected at the macrothematic level.

Context component	*Trends in the 20th century*	*Text level*
Text-external		
-Situation	Specialization Professionalization Technologization Internationalization Educational expansion Greater state involvement	Cognitive
-Actor	Greater differences More experts	Pragmatic
-Function	Diversification Information explosion	
Intertextual		
-Genre	Clearer genre boundaries Firmer genre conventions	Macro-thematic
Intratextual		
-Text roles	Author-reader more distant	Pragmatic
-Text means	Changed textual patterns	Micro-semantic

Figure 1. *Context component, trends in the 20th century and text level*

3. Method for cognitive text analysis

As a first example of how we try to grasp the correspondence between text and context, I will give a short description of our method for cognitive analysis and its contextual motivation. As was described in Section 2, the component *situation* is assumed to be reflected primarily at the cognitive level, an assumption which has served as a starting-point for my elaboration of our method for cognitive text analysis.

If we want to describe the situational context of LSP texts, we can choose frames of differing scope, as shown in Figure 2. The frame may be the actual situation in which the text is produced, or the situation within the specific field, or the broad societal frame.

All these frames, which are in fact interrelated, are important for a discovery of the correspondence between context and text. The inner frame, pertaining to the actual production of the text, is more or less unique for each text. However, for genre-bound changes, which are the concern of our studies at Uppsala, the other two frames are the most important, the middle frame showing factors unique to each field, and the outer showing factors common to all LSP texts.

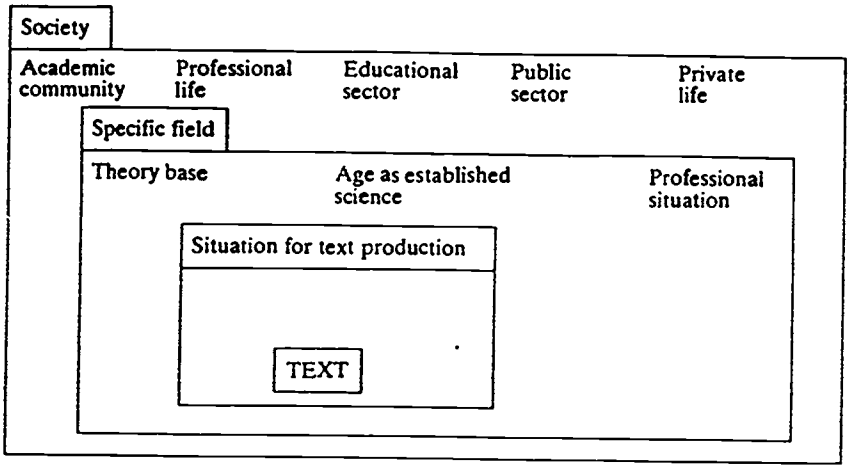


Figure 2. *The LSP-text and its situational frames*

In many respects, each field has developed in its own specific way. Theory bases are unique to each field. Fields also differ in how long they have been established sciences. The professional situation is a third factor that is unique to each field.

Texts in each field can, thus, be assumed to follow their own specific courses of development due to their unique histories. In many respects, however, their development may be assumed to be the same, reflecting changes in society as a whole.

Within professional life and the academic world, there are a number of trends that are quite noticeable. Specialization, professionalization, technologization and internationalization are terms used quite frequently to describe developments during this century.

With regard to the educational sector we can note a considerable expansion. As to the public sector, we can, for example, note that the standard of living of the average Swede has improved. We can also note a successively higher degree of state involvement, for example in social and financial matters. Finally, for private life, we find changed patterns in domestic and family life, and also in the role of leisure in the lives of men and women.

From this discussion of the analysis of the context component *situation*, I will turn to a description of our method for analysis of the cognitive content. The aim is to describe the cognitive network of texts, where by cognitive I mean a text level related to the content, that is the knowledge, presented in the text. The content varies, in fact, from field to field, from subject to subject, from text to text. At an abstract level it

can, however, be said to vary with regard to a few *cognitive worlds*: a *scientific world*, a *practical world*, an *object world*, a *private world* and an *external world*. These worlds correspond to the different sectors of society which were considered relevant to LSP texts, and to which changes during this century can be assigned; scientific world to academic community (and educational sector), object world to educational sector (and also to academic community and professional life), practical world to professional life, private world to private life, external world to public sector.

This world concept has similarities with the schema concept, which is familiar from theories within cognitive psychology. There, schema is used to cover quite different types of storing (cf Piaget 1929, Bartlett 1932, Wertheimer 1945, Schank and Abelson 1977, Thorndyke 1977, Kintsch 1978, Spilich et al. 1979, Voss et al. 1980, Schütz and Luckmann 1984). My world concept has similarities with the schema concept, in the sense of specific and general knowledge. The five worlds - scientific, practical, object, private and external - are possible knowledge structures, which means that they form a background for idealized authors when they construct texts and for idealized readers when they try to build up a mental representation of the text they read.

Figure 3 below shows the five cognitive worlds and their related categories *text type*, *aspect*, *dimension*, and *role*.

I have found it relevant to distinguish between two types of text content (text types): *object-descriptive* and *action-descriptive*. This distinction is not relevant for a categorization of the texts as a whole, but rather of their constituent parts.

Within each world, I identify certain abstract categories that are common to different texts. On one level these categories relate to different aspects: within the scientific world, *theory*, *classification*, and *experiment*; within the practical world, *work* and *interaction*; within the object world, *phenomenon*, *part focussed* and *whole focussed*; within the private world, *experience* and *personal situation*; within the external world, *conditions* and *measures* of social, economic and political kinds.

On another level, these categories relate to different (time) dimensions. For object descriptive texts, these (time) dimensions are *cause*, *phenomenon*, *process* and *change*/result. For action descriptive texts, they are *preventive measure*/cause, *phenomenon*, *measure*/process and *result*.

I also distinguish between different case roles, some of which are common to all five worlds. These are *time*, *place*, *quantity* and *frequency*. Other roles are specific to certain aspects, for the aspects analysis and interaction within the practical world as well as for experiment within the scientific world. These aspects are *agent*, *instrument*, *object* and *patient*.

Figure 3. *Text universe (invariant)*

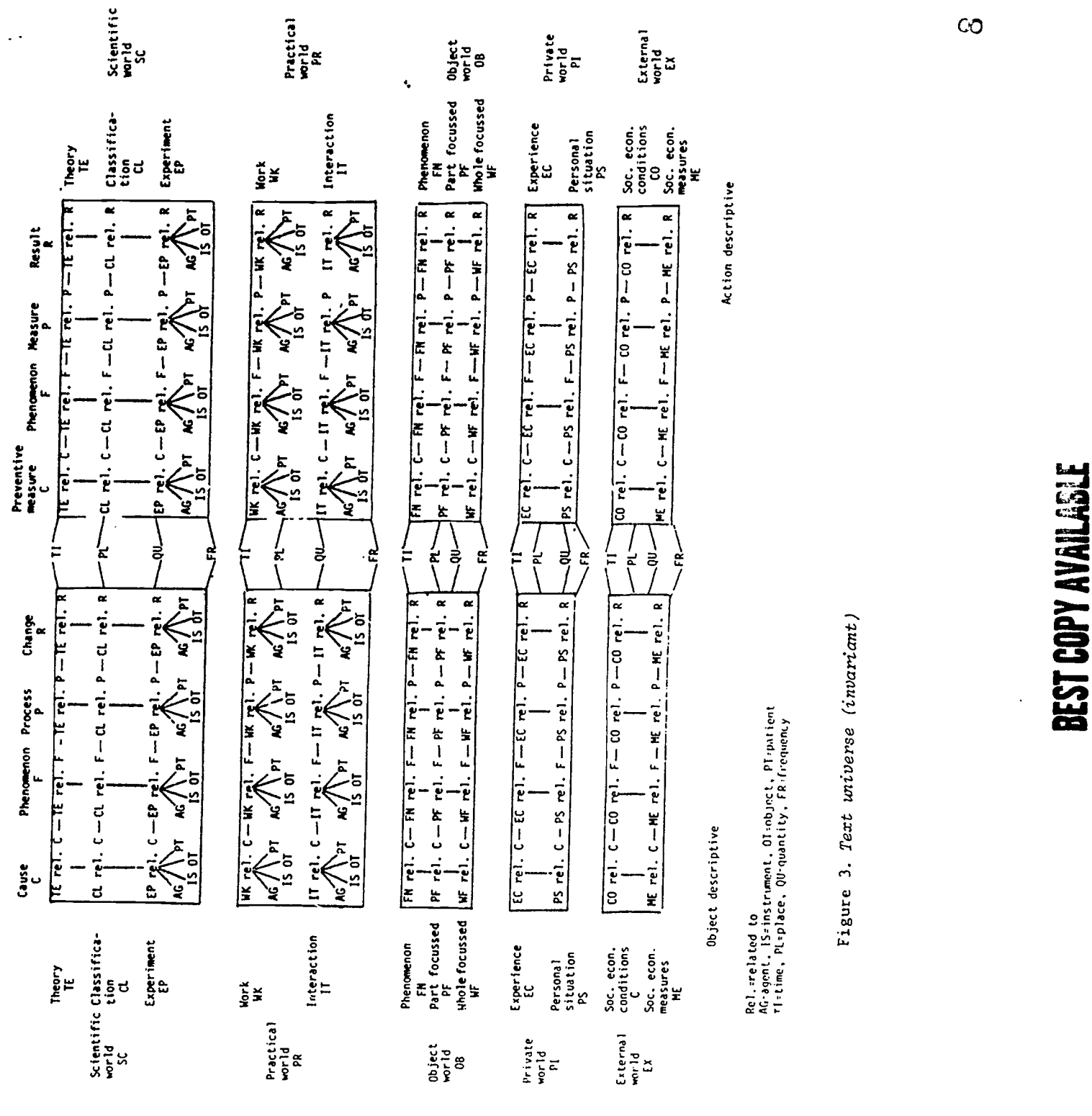


Figure 3. *Text universe (invariant)*

The roles time, place (or sector), quantity and frequency are placed outside the frames of the schemata. I have done so to emphasize the fact that these dimensions are not categories of the schema. Rather, they cause the schema as a whole to vary. The roles agent, instrument, object and patient are found in the scientific and practical worlds.

Figure 3 shows the invariant text universe. The worlds and categories do, however, also appear in variant forms. For our analyses of LSP articles at Uppsala, we have described a text universe for the medical field, another for the technical field and a third for the economic field (Gunnarsson, 1989: 20-22).

The cognitive content of the 90 articles in our study have been analysed in the five types of abstract categories: *knowledge world*, *aspect*, *type of text*, *dimension* and *role*. Each semantic text unit, approximately each proposition, has been categorized.[5]

4. Macrothematic analysis

As a second example of how we try to grasp the correspondence between text and context, I will describe some of our results from the text analysis at the macrothematic level. My focus will be on our explanations of the results.

As was shown in the first diagram in Section 2, the macrothematic structure was assumed to reflect the genre component. With regard to this genre component, two hypotheses were formulated in Figure 1: Clearer genre boundaries, and firmer genre conventions. Clearer genre boundaries mean, for example, greater distance between scientific and popular articles, scientific articles becoming more scientific, popular more popular. Firmer genre conventions can mean a greater homogeneity within genres, within science and popular science.

4.1 Method

For the text analysis at the macrothematic level, we have used a modified version of methods elaborated by researchers in Birmingham. In his book *On the Surface of Discourse*, Hoey (1983) distinguishes different text patterns: the Problem-Solution pattern, the Matching pattern, and the General-Particular pattern. Hoey's text patterns concern written texts in general. More directly related to scientific articles are, however, the categories which are suggested in Swales (1981) for a description of article introductions. Swales analyzed the introductory parts in articles from different sciences and found that these seemed to have a similar rhetorical structure. This could be summarized as four moves, which usually appeared in the following order: Move

1: 'Establishing the field', Move 2: 'Summarizing previous research', Move 3: 'Preparing for present research', Move 4: 'Introducing present research'.

Other researchers have tried to describe the moves for other parts of text, for example for the discussion part. In Dudley-Evans (1989) the following categories are enumerated: background information, statement of result, (un)expected outcome, reference to previous research (comparison), explanation of a surprising or unsatisfactory result, deduction, hypothesis, reference to previous research (support), recommendation, justification.

These categories and Swales' moves have been the starting-point for the method I have elaborated for our analysis of the macrothematic structure of the LSP texts in the Uppsala study. I have modified and expanded the Birmingham model, to make it useful for our analysis of not only contemporary texts, but also older ones, and not only articles within science, but also within popular science. The most important differences are the distinction of a supertheme called *conclusion*, and different macrothemes related to consequences and measures directed towards society.

The analysis of the macrothematic structure of LSP texts within our project has been carried out in two steps. Each macrosyntagm (each main clause and its subordinate clauses) has been categorized first as to *supertheme* (see 4.2) and secondly as to *macrotheme*.[6]

4.2 Results

I will now present some results from our analysis of the superthematic structure of Swedish LSP articles which are of relevance for the two hypotheses mentioned above.

Each macrosyntagm has been categorized as to *supertheme*: *introduction*, *theme-development*, *discussion* or *conclusion*. We have further distinguished *abstract* as a separate category. Results have been calculated for each text separately, and based on these text-individual data, means have been calculated for the different subgroups in our corpus.

Table 1 gives the mean percentages of the superthemes. Abstract and introduction are combined into one category, called introduction, and discussion and conclusion into one, called discussion. The table shows the mean proportion of the theme groups. Results are presented for scientific articles (S) and popular articles (P) from all three fields, from period 1, around 1900, period 2, around 1940, period 3 around 1980, and for all scientific articles (S1-3) and all popular articles (P1-3).

As Table 1 shows, around 56% of the science articles (S1-3) and 66% of the popular science articles (P1-3) have been classified as theme development. The introductory

parts occupy on average, 14%, a similar proportion in science and popular science. The discussion parts play a greater role in science, where the average proportion is 28%, which can be compared to 18% in popular science.

Table 1. *Superthemes in LSP articles: science (S) and popular science (P) from three periods of the 20th century*. Mean proportion of the articles.

Science	Intr	Theme	Disc	Popular science	Intr	Theme	Disc
	%	%	%		%	%	%
S1	16	50	33	P1	11	65	22
S2	10	57	31	P2	18	67	14
S3	17	60	21	P3	13	66	19
S1-3	14	56	28	P1-3	14	66	18

A comparison of the proportions for texts from different periods shows, in science, an increase over time for the proportion of theme development, from 50 to 60%, and a decrease for the proportion of discussion from 33 to 21%. In popular science it is more difficult to point to any clear tendencies.

Also of relevance for our hypotheses is a comparison of the diachronic changes in the proportion of the three supertheme groups for articles from the three fields. Figures 4a-c illustrate the supertheme development in scientific articles within the three fields. Figure 4a concerns the supertheme introduction, 4b theme development, and 4c discussion. The solid lines show the developments within economics, the dashed/dotted lines within medicine and the dotted lines within technology.

As the figures show, the lines describing the diachronic development within the three fields converge over time for theme development (4b) and discussion (4c) and somewhat also for introduction (4a). Economic, medical and technical scientific articles written around 1900 were quite different as to the proportion of different superthemes. Modern scientific articles (period 3) are, however, quite similar in this respect.

For popular science, there is, however, no similar tendency towards more homogeneous texts. The lines for period 3 are just as separate as for period 1.

Figures 4a-c. *Superthemes in scientific articles. Diachronic development within the three fields.*

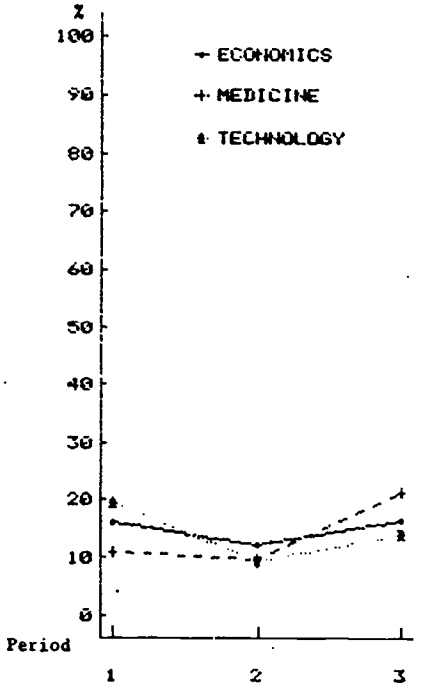


Figure 4a. *Introduction*

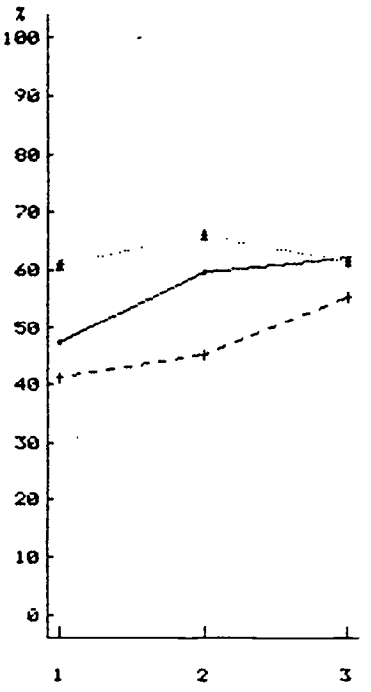


Figure 4b. *Theme-development*

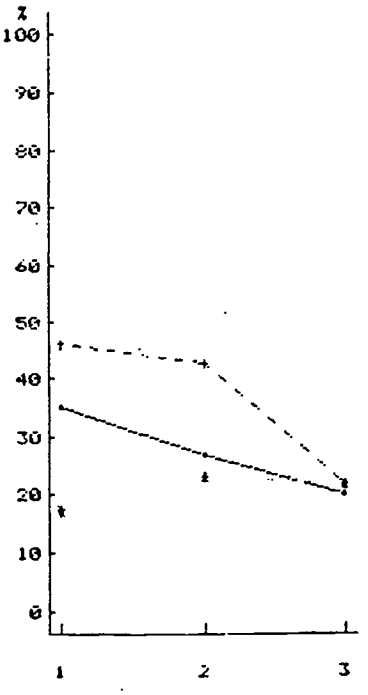
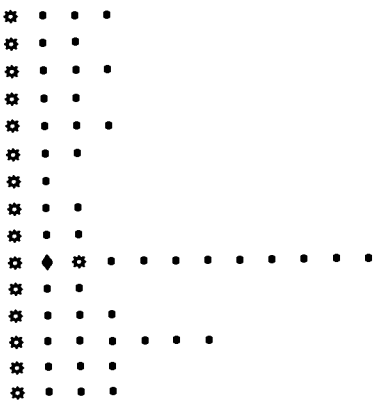
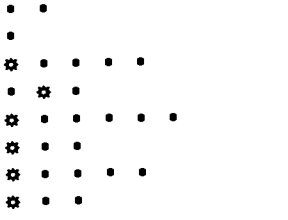
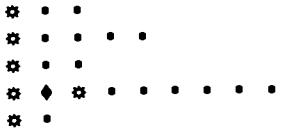
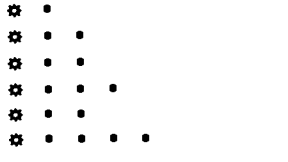
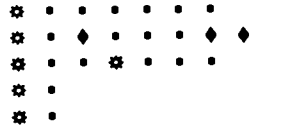
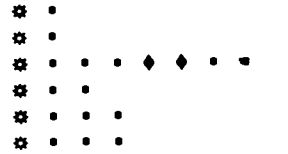
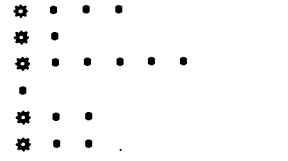
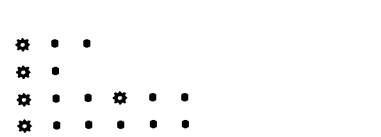
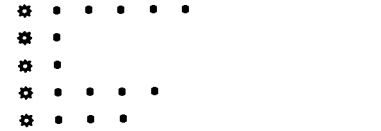
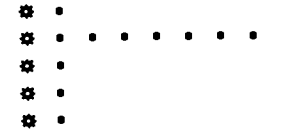
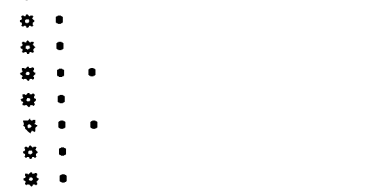
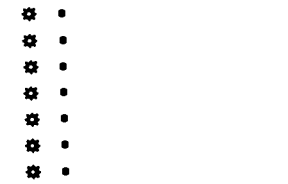


Figure 4c. *Discussion*

Table 2. *Superthematic structure in the 90 LSP articles*

✲ = introduction; • = theme cycle: TDC, TD, TC, T;
♦ = discussion cycle: DC, D

Text	Linear structure	Text	Linear structure
Science		Popular science	
ES1		EP1	
ES2		EP2	
ES3		EP3	
MS1		MP1	
MS2		MP2	
MS3		MP3	
TS1		TP1	
TS2		TP2	
TS3		TP3	

To get a picture of the overall thematic structure of the articles, I have described the linear progression of the four superthemes: Introduction, Theme development(T), Discussion(D) and Conclusion(C). These superthemes have been put together into three clusters or cycles: 1. introduction, 2. theme cycle, and 3. discussion cycle. By theme cycle, I mean a linear scquence starting with theme development and optionally followed by a discussion part and/or a conclusion part; the combinations TDC, TD, TC and T are each counted as one theme cycle. By discussion cycle, I mean a linear sequence starting with the supertheme discussion and optionally followed by a conclusion part, the combinations DC and D are each counted as one discussion cycle.

Table 2 shows the linear superthematic structure for each of the 90 articles in our corpus. The table is organized so as to facilitate a comparison of texts of different genres, from different fields and periods.

I would like to point to a few tendencies in Table 2. A comparison of the structures of the economic articles - E at the top of the table - with those of the medical - M in the middle - and the technical - T at the bottom, shows that the economic articles are of a more theme-repetitive kind, while the medical and technical articles have a more straightforward character, that is, first an introduction and then one or two theme cycles. If we look at the medical and technical articles we will further find that this straight, simple structure is more characteristic of the modern articles than of the ones from period 1 and 2. For medicine, we can also note that this straight structure more characterizes science - left part of the table - than popular science - right part.

Table 3 summarizes these findings in the form of averages for each text group. The table shows the average amount of cycles - theme and discussion cycles taken together - for the different text groups.

Table 3. *Average number of cycles (T- + D-cycles) in articles from different fields*

	Economics	Medicine	Technology
Science			
S1	2.6	2.0	2.6
S2	3.6	1.8	2.0
S3	3.4	1.2	1.4
S 1-3	3.2	1.7	2.0
Popular science			
P1	2.8	4.0	2.4
P2	3.2	3.2	1.0
P3	2.6	2.2	1.0
P1-3	2.9	3.1	1.5

As Table 3 shows, the economic articles differ on average from the medical and technical ones; there is no tendency for the modern economic articles to be more straightforward than the older ones. For medical and technical science, there is, however, a clear tendency for the modern article to be thematically more straightforward over time. Worth noting is also a tendency for the greatest difference to be between texts from periods 2 and 3, especially among the medical articles. There is, further, a decrease in the average number of theme cycles in medical popular science articles from period 3 as compared to articles from period 2. For technical popular science articles, however, the decrease takes place between periods 1 and 2.

This diachronic change of the superthematic text pattern could be explained as a tendency towards a more homogeneous pattern. Another possible explanation is that it reflects a shift in foreign influence on Swedish article patterns, from German to American influence. In Gunnarsson (1990b) I discuss such a shift in relation to a study of the introductory parts in medical articles. In this study, the article introductions in modern scientific articles were found to show greater resemblance to English patterns than did those of older articles. I related our results to those presented in Clyne (1987), where he compared discourse patterns in German and English articles. One of Clyne's findings was that the German article was more of a content-digressive kind while the English article was of a straight, one-perspective kind.

A possible explanation to the shift found in the superthematic structure of Swedish articles is that it reflects a shift from German influence on our text patterns before the Second World War to American influence after 1945. I can also add that a shift in influence on our belief system on a more general level has been discussed by many historians (Liedman 1977).

5. Discussion

Through this second example of our text analysis in the Uppsala study I have described some changes of textual patterns over time as well as differences between texts of different genres. From a sociolinguistic viewpoint, changes in text patterns are reflections of changes in the contextual frames within which the text functions, and I will here sum up the results by relating them to the two hypotheses posed earlier concerning the correspondence between text and context.

The first hypothesis was 'Clearer genre boundaries', and the results presented here point to clearer genre boundaries for the scientific text genre. This genre has followed its own course of development. Scientific articles have become more purely scientific (in the positivistic science tradition, I should add), as we have found that theme

development plays a larger role in scientific texts. In another study, where the pragmatic level was focussed upon, I showed that during this century the Swedish scientific article has become more purely informative, and more directed towards comprehension. Other types of thematic and pragmatic content have gradually decreased. The popular science texts have, however, changed less in these respects.

The second hypothesis was 'Firmer genre conventions', and I would here like to point to the more homogeneous character of the scientific articles. Articles from the three fields, economics, medicine and technology, were for example found to converge with respect to their superthematic structures. In relation to this hypothesis, I would also like to point to results from the pragmatic analysis within our project, which show an increase in the role played by metacomments related to text disposition in articles over our three periods (Gunnarsson 1990b).[7] Also, these results could be seen as reflections of a stronger awareness of genre conventions among the writers.

As to the linear thematic structure, the Swedish scientific article seems to have moved towards greater homogeneity, and in a direction that could be related to a shift from a German content-digressive type of text to an English straight, one-perspective type. The main shift seems to have taken place between periods 2 and 3, that is, after 1945.

Notes

1. The project team consists of myself as project director, Björn Melander, Harry Näslund and Björn Skolander.
2. A description of the material is given in Gunnarsson et al., 1987.
3. The analysis at the cognitive and microsemantic levels was made by Björn Melander and Harry Näslund in close collaboration. The analysis of the texts at the macrothematic and pragmatic levels has been carried out by Björn Skolander.
4. The model is described in Gunnarsson 1987, 1990a and forthcoming.
5. In Gunnarsson (1989) and in Melander (1989) the method for cognitive analysis is described in detail. Results from this part of our analyses are presented in Melander (1989), (1990), Gunnarsson (forthcoming). See also Melander's article in this volume.
6. For a description of our macrothemes, see Gunnarsson (1989:26-27).
7. Results from the pragmatic analysis have also been presented at the AILA World Congress in Greece, April 1990, and at ADLA's symposium on LSP in Copenhagen, Denmark in August 1990. The AILA 90 paper will appear in the following article: Gunnarsson, B.-L., Pragmatic and macrothematic patterns in science and popular science: A diachronic study of articles from three fields. Manuscript to Ghadessy, M., (ed), Registers of Written English II. Singapore.

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