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Hungarian scientific text types in the 16th, 17th and 18th century

My study focuses on a neglected component of scientific style, i.e. on the structure of the text. Text analysis thus manages to highlight the fact that during the period under examination, the first stage in the development of Hungarian scientific style, there were already rules of text construction and strategies of text structuring in the scientific style which assured the success of communication in the scientific communicative situation. There were already types of texts corresponding to specific communicative situations: prescriptive, descriptive, argumentative and narrative texts. I managed to create an image of the scientific writing of the epoch and the frequency of types. Measuring the percentage, I made an inventory of the characteristic forms of behaviour during the period, the strategies applied to solve scientific problems.

I subjected four Hungarian scientific works which were issued during the first period of development of the Hungarian scientific style (from the beginnings to the Age of Enlightenment) to a detailed text-analysis. The texts were Péter Mélius Juhász's *Herbárium* (1578), János Apáczai Csere's *Magyar Encyclopaedia* (1655), Ferenc Pápai Páriz's *Pax Corporis* (1690) and Péter Bod's *Magyar Athenas* (1766). My study focuses on a neglected component of scientific style, i. e. on the structure of the text.

This interest is also justified by the semiotic approach, the obligatory starting point thus being the close analysis of the text, of the complete unity from the point of view of communication. We might then reach a re-evaluation of the analysis of constitutive text elements such as compound sentences, sentences, and the lexicon in the light of these investigations (for the analysis of words on the basis of text-theory see Petőfi 1985, for syntactic analysis see, e.g. Brown and Yule 1983, Halliday 1985). Through this investigation I am seeking an answer to the questions: what regularities of writing were established in the scientific style during the period under study? Did any specific strategies of text structuring exist, strategies which could assure its success in the scientific communicative situation? Were the authors of the period already able to organize the scientific material in accordance with the principles of textual logic, with the demands of science? Are there any rules in the structure of thoughts, and what are the structures of text through which they are accomplished?

Analysing the different texts, I seek an answer to questions of how certain authors transmitted their ideas, how they modulate them, how they co-relate them, in other words, what linguistic means they used to modify ideas. When analysing the texts, I have the entire body of work in view, those basic types of writing which are the most characteristic of the whole work. Using Longacre's (1972) terminology, we see the "dominant" mode of the architectonics of the text, the one which defines it. The construction of a text has from its smallest components the form which serves the idea as it develops. The formation which appears is by no means arbitrary, but it can generally be typified from a linguistic point of view. "For the modulation of thought, the creation of a text has many dominant forms which vary according to the epoch, the genre or the author. Thus the text can be constructed upon the grammatical relationship between com-

pound sentences, ellipsis, association, rhythm, theme-development, etc." – Békési (1986: 7) points out.

The analyses revealed the fact that Péter Mélius Juhász's *Herbárium* is a prescriptive text, Apáczai's *Magyar Encyclopaedia* a descriptive one, Pápai Páriz's *Pax corporis* an argumentative one and Péter Bod's *Magyar Athenas* a narrative one.

The strategy of prescription is assured by delimitative-cohesive elements which form a temporal progression in evolution, in a present conditional time, respective to a projected, prescribed future. Besides, this type of text is also integrated by means of relations of content which correspond to the communicative intention which can be described with the following model:

REFERENCE TO LISTENER → APPEAL FOR ACTION → A FURTHER ALTERNATIVE STEP → POSSIBLE RESULT + CONSEQUENCE

"A raponcnak ha vizét veszed és két vagy három kalánnit innya adsz az hideglelőnek, igen jó. Hurutot, melyfájást megkönnyebbít, hévséget megállat." (215)

"Ha lisztvel öszvetöröd a levelét, az szömölcsöt, dagadást elrontja, és a testbe lőtt nyilat és mérges állat fulánkját kihozza. Minden belső rútságot kitisztít, mellyet, vesét, bélt, ezeket tisztít, ha szilvalében főzed és iszod e dutkóró füve virágát." (221)

"If you soak CELANDINE (Chelidonium majus) in water and give a person who has caught a chill two or three spoonfuls to drink, it will do him good. It also relieves the catarrh and cures the fever." (215)

"If you crush the leaves of the plant and also the bud to powder and mix it with flour, it cures swelling and brings out arrows shot into the body and the stings of poisonous insects. It will cleanse all inner impurities, cleanse the chest, the kidneys, the bowels, if you boil the flowers of this plant in the water in which plums have been boiled and drink it." (221)

The descriptive type of text is built on a repetition of the same theme:

$$(T_1 - R_1)\ (T_2 - R_2)\ (T_1 - R_n)$$

"A tevő ok az, amiből valami vagyon. Ez előkészíttetik, elrendeltetik és mozgattatik is a szerző októl, hogy az állató okot magába vehesse. Minek okáért a szerző okhoz legközelebb járul, és az állató okot meg- előzi, ő lévén a hathatóságnak és a szenvedésnek kezdete. A dologban behat, nemcsak erejével, hanem ugyan voltaképpen valóságával is, a dolognak valóságát belsőképpen tévén. E még csak módokkal sem kü- lönböztetik meg, mert jóllehet az erő sokképpen adattathassék a szerző októl, maga mindazonáltal a tevő oknak valósága nem egyébként, ha- nem voltaképpen közöltetik." (101)

"The operative cause is the one from which something is composed. It is prepared, organized and also moved by the generative cause, which also subsumes the stagnant cause. Therefore it is most closely con- nected to the generative cause, and it also precedes the stagnant cause, being the starting point of effectiveness and suffering. It penetrates the matter, not only by its own power but actually through its reality, form- ing the inner reality of the matter. It is impossible to distinguish them, for though the power might in many ways arise from the generative cause, the reality of the operative cause only appears in its very reality." (101)

or by a chain-like development of the theme:

$$(T_1 - R_1)$$
$$T_2 (= R_1) - R_2$$
$$T_3 (= R_2) - R_n$$

"A föld széne áll szárazból, vagy vízből. A szárazföld s széne nem üsmeretes mütőlünk, avagy üsmeretes. A nem üsmeretes az, melyen még müközülünk senki nem járt, bizonyos mindazáltal, hogy légyen... " (205)

"The surface of the earth consists of dry land and water. The dry land and its surface is either known to us or unknown. Unknown means the land where none of us has ever been, although it certainly exists... " (205)

(where *T* means theme, and *R* means rheme).

The structural scheme of the argumentative text is char- acterized by the fact that in the simple development of theme,

there is an upper layer of more explicit coordination or temporal subordination. Of the coordinative relationships, the most frequent are the adversative, explanatory and conclusive. Besides these, a model of the phrase-chain can be abstracted and can be shown as follows:

INITIAL ASSUMPTION – EXPLANATORY
PHRASE – ADVERSATIVE – CONCLUSIVE

"Valaminthogy a dögösség a rothadástól vagy a megveszéstől különböz, amennyiben a rothadás gyakran méreg nélkül vagyon, de a dögösség soha nincsen... Mert a pestis egyedül csak a mérges nedvességektől vagy gőzölgésektől származik... Ez a pestisbéli dögösség pedig elsősorban is a testben való nedvességekben esik belé... Noha mindazáltal meg kell vallani, hogy gyakorta a pestishez rothadás is járul... Innen vagyon, hogy sokszor a közönséges forró hideglelésből dögös hideglelés lészen... Néha pedig elébb esik a dögösség belé a testbe, s azután következik a rothadás a nedvességekben... Innen vagyon, hogy gyakorta akikre a pestis esik, azokon először semmi hideglelési forróság nem látszik, de azután a megrothadt nedvesség meggyúlván a magában egyenetlenül főződvén, a forró hideget is nekigyullasztja." (202)
"In the same way as disease differs from putrefaction or rabies, putrefaction is often without poison but disease never is... This is because the plague is caused solely by poisonous humidity or vapours... The plague first affects the humidity of the body... However, it must be admitted that putrefaction is often connected with the plague... This means that a common feverish chill often turns to pestilential chill... Sometimes the plague attacks the body first, and this is followed by putrefaction in the humidities... This means that those attacked by the plague often show no sign of fever in the beginning, but then, the putrefied humidity being kindled when heated in itself also kindles the feverish chill." (202)

The fourth type of text is the narrative one. The architecture of this type is achieved by means of a special local and temporal relation. This special co-relation of events or temporal succession is indicated by conjunction, tenses, word order, but above all

by means of temporal and local adverbs. The structural scheme of certain paragraphs is given by these adverbs themselves. For instance:

FROM EARLY CHILDHOOD... FOR EVER... IN THE YEAR 1662... THERE... THEN... AS SOON AS... SOON... THEN.

"Apáczai Csere János visszahíva Belgiumból a Fehérvári híres Kollégiomban az akkori szokás szerint tétetett collaborátornak. 1653-dik esztendő novemberében orált az bölcsességről... Végre Keresztúri Pál a fejedelemnek ezelőtt tanítója és igen kedves embere, ki Apáczait igen szerette szép tudományáért, azt javallotta, tegyék a Kolozsvári Oskolába mesternek. Mikor oda bévitetett, perorált az oskolának igen nagy szükségéről és annak okairól. Itt mindjárt tanítani kezdette a theológiát, philosophiát, mathesist, jurisprudenciát... Adott ki egy Disputációt de Politica Ecclesiastica. Nemsokára az Lengyelországi veszedelem miatt Erdély megháborodván sok nyomorúság következett, s ő is egészségének semmit nem kedvezvén és szorgalmatossággal nem tágítván megholt száraz betegségben Kolozsváron 1659-dik eszt."

"Having been called back from Belgium, János Apáczai Csere was, as was customary then, appointed assistant at the renowned College of Fehérvár. In November 1653 he made a speech on Wisdom... At last, Pál Keresztúri, former teacher and close friend of the Prince, who was very fond of Apáczai because of his learning, suggested that he be appointed Master in the school of Kolozsvár. When introduced there, Apáczai made a speech about the great need of the school and its causes. At once he began to teach theology, philosophy, mathematics and law... He published *Disputatio de politica ecclesiastica.* Shortly afterwards, due to the danger in Poland, as Transylvania was involved in the war, many misfortunes followed, and he, too, not caring for his health and not giving up his strenuous work, died in Kolozsvár in 1659."

After the dominant structural peculiarities of the four types of texts I have designated, I proceed to the internal structural features of the compound sentences forming the text. I further analyze those characteristics of sentence structures which affect the progress of communication. Of course, I do not consider that

these features are characteristic exclusively of compound sentences, but I analyze compound sentences as integrated parts of the text. By demonstrating the validity of the text's functional characteristics, which may also be supported by a quantitative analysis, I can point out the structural features of compound sentences, characteristic, in fact, of the whole of the text they are parts of. In all these cases I have applied Deme's method (1971).

The aim of the analyses is to find an answer to the question: what degree of complexity do the complete sentences of the texts have and what are the typical kinds of connection. Of the five criteria defined by Deme, I have limited my analyses to only three. To establish the degree of complexity of complete sentences, I have analyzed the indices of length and complexity, as well as the problem of agglomeration of sentences in blocks, and in order to discover the typical kinds of connection, I have made a quantitative and qualitative analysis of the connections between sentences.

On the basis of the calculations made for the whole of the compound sentence, the frequency of different groups of lengths is illustrated in the following table:

	HERBÁRIUM		ENCYCLOPAEDIA		PAX CORPORIS		ATHENAS	
Group	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
1/1	54	34,61%	30	30,67%	18	15,92%	31	32,62%
2/2	54	34,61%	25	26,04%	27	23,89%	27	28,42%
3/3	35	22,43%	21	21,87%	27	23,89%	14	14,73%
4/4	10	6,41%	15	15,62%	18	15,92%	14	14,73%
5/5	3	1,28%	3	3,12%	10	8,84%	3	3,15%
6/6	1	0,64%	1	1,04%	6	5,30%	1	1,06%
7/7	0	0,00%	1	1,04%	4	4,54%	4	4,21%
8/8	0	0,00%	0	0,00%	1	0,88%	1	1,06%
9/9	1	0,64%	0	0,00%	1	0,88%	0	0,00%
11/11	0	0,00%	0	0,00%	1	0,88%	0	0,00%

When the units of the text are compared, it can be seen that linguistic units formed of a single sentence are the most rare,

15,92 % in *Pax corporis,* but in the other three corpora their frequency is also under 50%. As for the percentage of different groups of length of compound sentences, we shall see that in *Herbárium,* in *Encyclopaedia* and *Athenas* this gradually shrinks with the growth of the sentence, whereas in *Pax corporis* it grows up to a certain point. This means that the highest degree of complexity of complete sentences is in *Pax corporis.* To ascertain the exact degree of complexity of text units, the complexity index seems to be the best suited, this being the quotient of the units from the whole sentence and of the sentences contained in the analysed corpora. The complexity index calculated for the four texts is: *Herbárium* 2,07 csu/cs, *Encyclopaedia* 2,42 csu/cs, *Pax corporis* 3,24 csu/cs, *Athenas* 2,52 csu/cs.

All this means that *Pax corporis* presents the highest degree of complexity. The conclusion can be drawn that the argumentative text is the most complex, it prefers those types of compound sentences which are formed from a greater number of sentence units. Meanwhile the descriptive, narrative and prescriptive texts favour a less complex sentence construction. This is natural if we think of the strategy of argumentation, the writer being obliged to bring up arguments and counter-arguments to form an initial hypothesis and concomitantly to draw conclusions later.

Since the block of sentences is a category of transitional size between the complete compound sentence and the unit from the sentence, the analysis of block-agglomeration of sentence units offers further important data regarding the degree of complexity of the units of the text under study.

I mainly focus on the conditions of agglomeration, in other words, on the number of units from the complete sentence which form a block. In every group of length, I calculated the effective agglomeration index (A_e) on the basis of text units, i. e. how many units of text are there on average to a block in the same

unit, and then the index of principle (A_p) which is the possible agglomeration. The quotient of the two figures shows the degree of utility (U), i. e. how many of the possible sentence units per block (after the calculation operated on the corresponding length-group of the sentence) are realized in the actual text.

In group 3/3

HERBÁRIUM	ENCYCLOPAEDIA	PAX CORPORIS	ATHENAS
A_e = 2,14 csu/b	A_e = 1,85 csu/b	A_e = 1,95 csu/b	A_e = 1,45 csu/b
A_p = 2,00 csu/b	A_p = 2,00 csu/b	A_p = 2,00 csu/b	A_p = 2,00 csu/b
U = 107 %	U = 92,5 %	U = 97 %	U = 71,5 %

csu = complex sentence unit
b = block

In group 4/4

HERBÁRIUM	ENCYCLOPAEDIA	PAX CORPORIS	ATHENAS
A_e = 3,28 csu/b	A_e = 2,85 csu/b	A_e = 2,57 csu/b	A_e = 1,75 csu/b
A_p = 2,50 csu/b	A_p = 2,50 csu/b	A_p = 2,50 csu/b	A_p = 2,50 csu/b
U = 131 %	U = 114 %	U = 102 %	U = 70 %

In group 5/5

HERBÁRIUM	ENCYCLOPAEDIA	PAX CORPORIS	ATHENAS
A_e = 4,00 csu/b	A_e = 3,75 csu/b	A_e = 2,94 csu/b	A_e = 3,75 csu/b
A_p = 3,00 csu/b	A_p = 3,00 csu/b	A_p = 3,00 csu/b	A_p = 3,00 csu/b
U = 133 %	U = 125 %	U = 91 %	U = 125 %

In group 6/6

HERBÁRIUM	ENCYCLOPAEDIA	PAX CORPORIS	ATHENAS
$A_e = 3,00$ csu/b	$A_e = 2,00$ csu/b	$A_e = 3,27$ csu/b	$A_e = 3,00$ csu/b
$A_p = 3,50$ csu/b	$A_p = 3,50$ csu/b	$A_p = 3,50$ csu/b	$A_p = 3,50$ csu/b
U = 85 %	U = 57 %	U = 93 %	U = 85 %

When the effective agglomeration indices for the four units of the text are calculated for certain groups of sentence length, it will be seen that in *Herbárium* and *Encyclopaedia* the effective-agglomeration index is higher than the index of principle.

From all this, we conclude that the argumentative and narrative texts mainly use decomposure into smaller blocks of whole compound sentences. The descriptive, and even more the prescriptive text, does not decompose whole compound sentences into so many blocks. The compound sentences with one or two blocks are more frequent. Thus, a block evidently embodies a greater number of text units.

The structuring of compound sentences from text units is always assured by the connections between sentence units. We shall analyze the connections from two points of view: quantitatively and qualitatively.

In the quantitative analysis, the index of text-structuring *(S)* is obtained from the quotient of the number of all the connections among the text units and the number of compound sentences which contain them.

HERBÁRIUM	ENCYCLOPAEDIA	PAX CORPORIS	ATHENAS
S = 1,46	S = 1,40	S = 2,40	S = 1,90

The number of connections is, as we can see, much greater in *Pax corporis*. Looking beyond the figures, we can

then say that it is not an accident that the most complicated text, the argumentative one is characterized by a higher degree of complexity.

As for their quality, the connections can be coordinative or subordinative.

Later, I shall try to show the kinds of qualitative connections, which are typical of certain units of text. Comparing the percentage of participation of coordinative connection forms, it can be seen that the simplest, the copulative one, is the most frequent in the narrative and descriptive texts. Here, too, the specific communicative situation, the author's intention, is the one which accomplishes the sentence construction corresponding to the strategy of argumentation, for besides arguments, counter-arguments also have to be raised, so that the writer is able to convince the reader of the correctness of the hypotheses and their validity.

	HERBÁRIUM	ENCYCLOPAEDIA	PAX CORPORIS	ATHENAS
Copulatives	68,68%	72,74%	54,54%	83,74%
Adversatives	7,07%	14,92%	36,36%	16,26%
Disjunctives	1,01%	3,58%	1,01%	0,00%
Explicatives	3,03%	0,00%	0,00%	0,00%
Conclusives	20,20%	10,86%	8,08%	0,00%
Predicatives	4,49%	3,93%	0,00%	0,00%
Subjectives	5,61%	3,86%	17,02%	3,12%
Completives	4,49%	0,00%	5,31%	10,41%
Adverbials	73,03%	41,00%	60,10%	47,91%
Attributives:	12,35%	51,18%	17,55%	36,46%
Concessives:	0,00%	0,00%	0,00%	2,09%

There is another type of coordinative connection of a great significance, the conclusive, which appears most frequently in the prescriptive text. The legitimacy of this must be sought in the strategy specific to the usage mode of recommendation because, on the basis of context relations, the following model of text writing can be abstracted:

REFERENCE TO LISTENER → APPEAL FOR ACTION
→ A FURTHER ALTERNATIVE STEP → POSSIBLE
RESULT + CONSEQUENCE

This model well illustrates the importance of conclusive
connectives in this type of text.

As for the subordinative compound sentence connectives, it
can be observed that the adverbial secondary clauses are the most
frequent. In the *Herbárium,* i. e. a prescriptive text, the time
clause with a conditional aspect is the most frequent, this fact
being justified by the specific strategy of text construction. It can
also be shown that delimitative-cohesive elements appear as an
upper layer in the development of an existing theme. They
constitute a temporal progression going on in a present
conditional tense, with respect to a recommended future. In the
argumentative text, owing to its specific character, an adverbial
clause of cause is the most frequent. This is similar to the
explanatory coordinative connective which typically appears in
the structure of the text.

Among the subordinative connectives, the attributive sec-
ondary clause has a considerable frequency. It appears in the
descriptive text. In this type of text, the accent falls upon the
characteristics of the objects or events presented.

As a result of the analysis, it can be said that the four types
of texts have well-defined features not only at the level of text
structure, but also of compound sentence structure. The texts ana-
lysed thus demonstrate that, besides the description of facts, the
writer expresses his own point of view, his attitude towards the
facts, even the receiver's points of view through the character-
istics of text structure and sentence structure which result from
the specific communicative situation.

Text analysis thus manages to highlight the fact that during
the period under examination, the first stage in the development

of Hungarian scientific style, there were already rules and strategies of text construction and text structuring in the scientific style which assured the success of communication in the scientific communicative situation. There were already types of texts corresponding to the specific communicative situation: prescriptive, descriptive, argumentative and narrative texts.

A detailed analysis of all the Hungarian scientific works of this epoch would have gone beyond the scope of the present study. However, on the model of the texts analyzed herein, I read and analyzed other scientific works dating from the same period and ranked them according to text type. Thus I managed to create an image of the scientific writing of the epoch and the frequency of types. Using percentages, I made an inventory of the characteristic forms of behaviour during the period and the strategies applied to solve scientific problems.

If the order of frequency of the text types is taken into account, they can be divided as follows:

ARGUMENTATIVE: 8 scientific works
DESCRIPTIVE: 6 scientific works
PRESCRIPTIVE: 4 scientific works
NARRATIVE: 3 scientific works.

During the epoch under investigation, there were four different types of scientific texts, but their frequency varies. This fact cannot be mere chance, if we consider the social and psychological context. In the case of scientific works in the native language, there was a need to catch up with general scientific development between the 16th and 18th centuries, and so didactic works are more frequent than argumentative and explicative texts. The descriptive texts present the facts studied or discovered in a certain branch of science, the prescriptive texts appear in the domain of medicine and botany because they contain recommendations for different types of treatments.

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