

Hyper-Themes in the Structure of Scientific Texts

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It is my purpose in this paper to draw text students' attention to the macro-structure of scientific texts, which is but the reflection of the overall effects obtaining from the realization of three main functions as proposed by Halliday's well known approach to language (1985).

Thus I concentrate on the piecemeal grammatical analysis of the structures of scientific texts and in special in the thematic structure which should provide us with enough information about the underlying topic arrangement and coherence of that type of discourse.

1. Although quite a number of studies have been devoted to the issue of the underlying semantic structure of texts (macro-structure) where regular schemata of the kind *Problem-solution* and the like have been found (Hoey 1983, Jordan 1984), little has been done to justify such claims in a piecemeal study of the scaffolding of the scientific text.

Our aim here is to remedy this dearth of studies by tackling in some detail a number of major snags presented by scientific texts in their (uneven) unfolding.

As is well known, texts are considered basic units of oral or written communication because they are supposed to deploy enough signals to be self-contained wholes. This quality has often been referred to as *texture* (Halliday 1978) which is assured by the reference chains and other grammatical and lexical cohesive devices throughout the text.

Halliday has drawn attention to texture as conveyed by *theme structure* realized through the clause. Thematic patterns, according to his view, are not optional stylistic variants, but rather, "an integral part of the meaning of language. Texture is not something that is achieved by superimposing an appropriate text form on a preexisting ideational content" (Halliday 1978: 3).

Now in order to account for texture we need to look at the intra-sentential textual resources –thematic and information structures– alongside with the inter-sentential resources of cohesion.

This integrative idea of simultaneous networks combined in the grammar, where textual or ideational components have no precedence over one another, has been somehow negated: we strive to find a primitive logical meaning which should underlie (as a sort of deep structure or *schema*) the text.

Since text is defined as a semantic unit, it is the place of simultaneous realization of several strands of meaning: *ideational* (referential) as well as *interpersonal* (speech acts) and *textual* (thematic).

Bearing these assumptions in mind, we should like to argue that the lexico-grammar, seen as piecemeal realization of higher order semantic meaning, should yield structures of an undetermined length, "A text is, as I have stressed, an indeterminate concept. It may be very long or very short; and it may have no very clear boundaries" (Halliday 1978: 141).

So when we are talking about "the structure of the text" we are not just referring to the synthetic-analytical model of text proposed by J.S. Petöfi (1978) where two levels of semantic representation are contemplated, namely, *textual manifestation* and *textual base*: the text essentially consists of a "sense structure" which is an implicit information designed previously so as to arrange the explicit lineal structures.

If we claim, however, following Halliday (1985), that the dynamic unfolding of the text is realized simultaneously by the conflation of three *metafunctions*, it is highly unlikely that one of them should take precedence and likewise be explained in terms of the information given in a prior stratum.

2. We would like therefore to make clear that, when we concentrate on the *thematic* structure of an actual scientific written text, we are not excluding the other two main sources of information, namely, the ones present in the interactional meaning and the conceptual-logical meaning.

Let us illustrate this by showing a text broken down into clauses:

TEXT

- a *It is the business of the scientist to accumulate knowledge about the universal and all that is in it,*
- b *and to find, if he is able, common factors which underlie*
- c *an account for the facts that he knows.*
- d *He chooses, when he can, the method of the "controlled experiment."*
- e *If he wants to find out the effect of light on growing plants,*
- f *he takes many plants, as alike as possible.*
- g *Some he stands in the sun, some in the shade, some in the dark;*
- h *all the time keeping all other conditions (temperature, moisture, nourishment) the same.*
- i *In this way by keeping other conditions constant,*
- j *and by varying the light only,*
- k *the effect of the light on the plants can be clearly seen.*
- l *This method of using 'controls' can be applied to a variety of situations,*
- m *and can be used to find the answer to questions as widely different as 'Must moisture be present if iron is to rust?' and 'Which variety of beans gives the greatest yield in one season?'*
- n *In the course of his inquiries the scientist may find*
- o *what he thinks is the common explanation for an increasing number of facts.*
- p *The explanation,*
- q *if it seems consistently to fit the various facts, is called a hypothesis.*
- r *If a hypothesis continues to stand the test of numerous experiments*
- s *and remains unshaken*
- t *it becomes a law.*

There must be an intersection of lexical strings and referential chains with Theme in order to account for the semantics of discourse or the development of the text topic.¹

1 For a definition of a theme we quote again Halliday, "The Theme is the element which serves as the point of departure of the message; it is that with which the clause is concerned... First position in the clause is not what defines the Theme; it is the means whereby the function of Theme is **realized** in the grammar of English." (Introduction to Functional Grammar 1985: 39).

Subject conflates with unmarked topical theme in English.

It is the business of the scientist is a marked topical theme (which is, therefore, not conflated with the subject as all formal it-clefts).

So the point of departure of the clauses is a marked identifying clause with the focus of New information of a modalization metaphorically expressed by the noun *business*. The congruent form would be: "*scientist must/should accumulate knowledge...*". The Process in turn has been converted into a non-finite nominal construction. The three following Rhemes are dependent on the same Theme. The selected Theme somehow predicts the following pattern of interactions of Themes and unfolding reference strings: it is a Hyper-theme (Martin 1992).

The "Vocabulary 3" lexical item "business" (Winter 1977) signals the next paragraph reference chain:

- (a) *It is the business of the scientists*
- (d) *He chooses*
- (e) *If he wants*
- (f) *He takes*
- (g) *Some he stands*

Here we have again a marked Theme linked to the Rhemes of the previous clause. The now Given information is here highlighted as Theme due to a division of the subject-matter (the plants) into partial quantities (*some... some... some*).

3. The hyper-Theme then, it may be argued, is triggered by the very first clause: *It is the business of scientists* whose personal part is referentially repeated in an anaphoric string: *he* (unmarked in d, e, f, and marked in g).

One next hyper-Theme is marked thematically: two hypothetic manner clauses linked by 'and':

- i *by keeping (other conditions constant)*
- j *and by varying (the light only)* (again a semi-nominal (non-finite) metaphor after the PP structure).

This predicts the next cohesive chain of Themes:

- k *The effect of light in the plants can be* (nominal grammatical metaphor)
- l *This method of using 'controls'* (again a lexical item bearing the feature of anaphoric replacement).²
- n *In the course of his inquiries the scientist may find* (another Vocabulary 3 explicit signal that refers back to the questions raised).
- p *the explanation [is called]*
- q *If it seems*
- r *If a hypothesis [continues]*
- t *it becomes a law.*

This last part is a neat organization of the text unfolding, rather like an alternating staging of Theme-Rheme structure together with a congruent Given-New information structure (i.e. a conflation of Theme/Given).

This method / used to answer questions
T₁ (G) → R₁ (N)

In the course of his inquiries / the scient. may find an expl.
T₂ (G) → R₂ (N)

The explanation (if it...) / is called a hypothesis
T₃ (G) → R₃ (N)

If a hypothesis / continues to stand the test
T₄ (G) → R₄ (N)

It / becomes a law.
T₅ (G) → R₅ (N)

2 E.O. Winter. 1979.

Halliday and Hasan (1976) stress the value of lexical reiteration: strings of lexical sets running through the text can be strung together thus:

<i>knowledge</i>	————▶	<i>facts</i>	————▶	<i>common factors</i>
<i>metho</i>		<i>deffect of light</i>		<i>controlled experiment</i>
<i>answer/quests.</i>		<i>growth of plants</i>		<i>constant/vary situat.</i>
<i>explanation</i>		<i>(number of facts)</i>		<i>(test) experiments</i>
<i>hypothesis</i>				
<i>law</i>				

4. The scaffolding of the hyperTheme-Theme structure may not seem sufficient (superficial) evidence to show the underlying semantic pattern of a text that is often schematically summarized as: (situation) *Problem / Solution* (evaluation) (Hoey 1983; Winter 1982; Jordan 1984) or which may be achieved by directing questions to the text: *how?, what?, who?, why?*

	<i>General Situation</i>	(what is the scientist concern?) (to accumulate and to find common factors)
(Therefore)	<i>Response</i>	(he chooses the method of C.E.)
(If...)	<i>Exemplification of the Problem</i>	(if he wants to find out...)
(Then)	<i>Response</i>	(he takes many plants)
(How)	<i>Instrument</i>	(by keeping... & by varying)
	<i>Result</i>	(effect of light... can be seen)
	<i>Evaluation</i>	(this method can be applied and can be used)
(If...)	<i>Contingent Situation</i>	(the scientists may find a common explanation)
(Then...)	<i>Result: evaluation</i>	(the explanation called hypothesis)
(If...)	<i>Contingent Situation</i>	(if the hypothesis stands the test)
(Then...)	<i>Result: evaluation</i>	(it becomes a law)

This outline of an overall cognitive schema should coincide with the information chosen by the writer in the Theme structure where he signals the starting point of the message as Given in unmarked cases. Where the focus is on the Theme the New information becomes a sort of *Hypertheme*, so highly stressed as to predict the following Themes. However, the text has further meanings than the textual. More specifically the subject as *doer* of actions and *senser* of phenomena may be subjected to modal filters in the propositions and proposals expressed.

5. In our text the responsibility of the scientist is somewhat unburdened by the insertion of parenthetical conditions. This assumption gives us the idea that a text should be considered as a dynamic, ongoing process of meaning rather than a static product, the object of formal linguistic analysis.

b *if he is able*: the scientist is supposed to feel inclined (willing) to attempt findings (conditional proposal).

d *when he can*: it is a synonymous formulation of the previous conditional proposal of inclination, charged to the responsibility of the scientist.

l *can be applied (and can be used)*: the author makes a general statement as regards the uses of the method: but he is suggesting that it is up to the scientist to implement that method in a disguised demanding for action: a modalization of moral obligation to the scientists.

h *the scientist may find*: the expression of the author suggests epistemic possibility meaning: perhaps, it is likely (that he will find), (I am not quite sure)... yet it is most probable (that he finds): *modalization*.

These four expressions of *modality* tell us a lot about the meaning of the text and reinforce the thematic structure as sketched above. It follows from this that scientists are supposed to, and are therefore morally responsible for, carrying out their experiments with a certain method objectively tested. Such method should also be tried out through relevant tests in a number of situations, whenever occasion allows or conditions are favourable. If this is done so, then the scientists will be able to reach the summit of their method, leading to the formulation of a binding-rule or a *law*, after having tested their strong hypotheses.

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