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Characteristics of the language of science

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1. Introduction

Is science any more special than any other subject in being less culture bound, and less subject to the usual differences between languages and consequent problems when translation is undertaken?

The question is put, **what makes this language different** from any other language used in any other discipline? Each discipline has to have a certain amount of specialised vocabulary, but is the language of science more than this? Is it true to say that science is largely culture free?

The question is important for language teaching. If there are certain areas of language that are used more frequently in science than in non-science oriented language course, then these are the areas to concentrate on in the ESP lessons.

2. Pair work

What characteristics does the language of science have? What does it have in common with ordinary language? Which part is the greater? (common or specialist)

3. Stevans (1977)

- a. Stevans in a survey article (1977) asks what is the nature of scientific discourse and what is different about it compared with the rest of 'normal' language. (p153-4). He says that scientific discourse uses a lot of words, roots and affixes of Greek and Latin origin, and uses, or has access to, symbols, numbers, names of chemicals etc which are largely international in character.

In many respects scientific language is normal in that a scientist functions in a host language using the same system of pronunciation, the same accent, the same common grammar, rules of spelling and orthography, and even a lot of the common non-specialised vocabulary as anyone else.

ie, all the parts are there, but the proportions in the mixture are different.

For Stevans scientific discourse is like a different style, therefore the differences can be explained not in terms of the basic components of the language, but in terms of, . . . the statistical properties of the mixture in which they occur, and the intention, the purpose, behind their selection and use. (1977 p153)

b. The features of scientific prose for Stevrens are,

- 1) *rather long sentences* containing many clauses, often in complex degrees of dependency and with much embedding;
- 2) *long nominal groups* containing strings of adjectives or nouns acting as adjectives, each providing the greater specificity that comes from modification upon modification,
- 3) *frequent passives* which have the effect of putting important ideas in initial position where in English they carry salience of meaning. (1977 p154 layout of quotation altered for clarity).

4. Stevrens (1976)

'Scientific English' is simply 'English used by scientists or for the purposes of those engaged in science'. It has the same grammar, pronunciation and spelling as are found in all kinds of English; it includes much of the general vocabulary of English, though with a large number of specialized items or of familiar words used in specialized ways; it also carries an array of linked symbols and visual symbolizations which nevertheless can be verbalised by those who know the rules for doing so.

What then is different or special about 'scientific English'? A brief and oversimplified answer is that the particular mixture of grammatical and vocabulary items typically found in 'scientific English' may display some or all of an array of features, including eg:

- long and complicated noun-phrases . . . ;
- a higher proportion of passive constructions . . . ;
- the frequent use of logico-grammatical items . . . ;
- a high proportion of items of specialised vocabulary. . . .

Equally important is the fact that the argument, the rhetoric, the communicative function of scientific English is chosen so as to serve the particular purposes of the writer or speaker. (1976 p64 layout of quotation altered for clarity).

So, logic, linkers, and specialised vocabulary which is a problem for uniformed NS (native speaker) as well as NNS (non-native speaker). This gives some clues as to what should be emphasised in teaching. But remember, Stevrens was pre-Corpus Linguistics. His ideas were informed guesses.

5. Ewer (1971)

Ewer compared the English of science with that of the more 'general' English course (E.L.T.) given in schools. He notes the wide variation due to lexis, but also found variations at the level of grammar. He notes the differences, as in the figure 4.1 below, and concludes,

It is therefore clear that any E.L.T. (English Language Teaching) materials for science students must place special emphasis on these items. (p67)

EWER'S LIST OF GRAMMATICAL ITEMS THAT NEED STRESSING IN ESP (1971 p67)

Group I: Items essential to basic scientific English but not presented and exercised in any of the courses:

- ing forms replacing a relative
- Infinitive as substitute for longer phrases
- Words similar in form but with different meaning for the same function
 - Most prefixes and suffixes.
- Most structural and qualifying words and phrases

Group II: Items essential to the basic scientific English but not presented and exercised in two out of the three courses or dealt with inadequately:

- Compound nouns, Passives, Conditionals, Anomolous infinitives
- Cause-and-result constructions
- Words similar in form but with different functions
- Past participle usage
- The prepositional (two part) verbs common in scientific English.

6. Robinson (1980)

In Chapter two, 'Survey of the theoretical positions' Robinson gives a brief historical survey of ESP, reviews 'register analysis', 'discourse analysis' and the 'communicative approach' amongst others.

Robinson says that the existing data is insufficient to establish and differentiate a clear 'register' of science. The 'surprise' of Ewer and Latorre at the

“**great variety of writing in scientific English**” (1967 p224)
is reported, and **the fact that different sub-registers “tended to use distinct structures”** (1967 p224).]

Remember, only a minority of scientists read research papers, and yet research papers as a genre have been the most studied by ESP researchers.

There is though broad agreement that **scientific English is general English plus the extra components of science.** (Robinson 1980 p17). She says that there is a great need for less generalisation and greater precision that could account for differences of opinion. Swales for instance has advocated that the main verbs in scientific texts are generally in the present simple tense (I go) whereas Close emphasises the continuous form of the verb (I am going). (Robinson 1980 p19.)

A broad agreement that **the discourse markers, and connectives (linkwords) are important**, does seem to exist. (p21), though ironically Robinson remarks of connectives that they are perhaps important “ . . . not because they are special to ESP but because the general ELT (English Language Teaching) has so far ignored them”. (p21). Discourse markers then are not necessarily unique to science, but are very important, as Dawe (1983) argues. In his research he found that the single most important difference between immigrant children and their monolingual counterparts was that the immigrants, proficient in all other areas, were weak on linkwords.

7. Widdowson (1974)

Scientific language avoids the first and second person (p288), thus detaching a message from its sender and receiver. The passive is used. 'We' is also used, but in a special way, to refer to both the person communicating and the person being addressed.

It is important to recognise that the 'depersonalised' statement of the scientist represents a way of referring to phenomena in a 'non-ordinary' manner which is as much an essential part of science as is the 'subject matter' (p289).

New terms in literature are complex (<wind> can be inanimate and human) in science they are compound such as "copper electrode" (p290).

This to Widdowson is not a point of grammar. The example given of a compound, "copper electrode", while grammatically equivalent to "the electrode which is made of copper" (p290) does not have the same value. The compound term is a name of something already viewed as having a distinct separate entity, and the stress is on this name, not on describing the electrode.

To summarise. Scientific English then to Widdowson is characterised in communicative terms by for instance the impersonal passive, the use of 'we' to refer to writer and reader, and compound rather than complex terms.

NB 8. Robinson 1991

"The general conclusion ... is that 'science' is not a homogeneous linguistic entity, that the writer's purpose and audience rather than the topic are the determinants of linguistic forms" (p24).

9. Discussion

It is obvious that scientific English is somehow different to ordinary English, but attempts to state precisely where these differences are, have largely failed. Strevens' generalisations are useful guidelines, but are not applicable to all scientific writing. Ewer's lists are a step in the right direction but are as much based on educated guesses as hard experimental data that are widely applicable. Widdowson's argument that scientific language uses impersonal forms is an over-generalisation: some styles do, but not all journals require the use of the passive, for it is sometimes important to state who is doing the action, because the person can affect the results.

Part of the problem is the sheer complexity and variety of language. Another part is the broadness of the question which may need breaking down into smaller components. The world of science is vast. What part of this scientific world is being analysed? Once the answers start arriving for small clearly defined areas, the evidence can be put together and wider conclusions made with a higher level of confidence.

A comparable question is what distinguishes the language of history from normal English, and on what evidence. Therefore what is special about science, and is science more than any other specialised subject of enquiry.

Please study the above beginning of a discussion as a model for theses. In particular, the first paragraph summarises the viewpoints and assesses them, pointing out the limitations. The criticism is gentle but firm and to the point.

The second paragraph gives some of the reasons why the problem is so difficult.

The third paragraph puts the discussion of the language of science in the wider context and asks why science is more special than any other subject.

Of course, the writers above were working in the days before there were large databases of analysable data. Corpus Linguistics methods allow researchers to ask this question afresh. That is another subject. At the time I did my research, I went on though to ask and give a tentative answer to a supplementary problem: what makes a difference significant?

10. A significant difference

- a. **Documentation of differences** must also precede an evaluation of their significance. Ewer (1971) lists some features of scientific English and points out that given the differences and the difficulties they cause for students,

The important thing here is to determine clearly which of the difficulties that students appear to encounter are significant. (1971 p68)

- b. Pairs. What is a <significant> difference?
- c. Ewer (1971). This raises the question as to what is a significant difference. Ewer sees a significant difference as one giving significant difficulties to the students. This helpfully stresses the student's opinion about the differences (in contrast to the teacher dealing thoroughly with the points he himself may have had difficulty with, or conversely, points he has a special facility in teaching) but begs the question as to what is a significant difficulty. Ewer describes a significant difficulty as that which gives rise to 'unacceptable' mistakes ie that interfere materially with communication between scientist and scientist. Significance depends on what you want to do.
- Passives, nominals, – transfer
 - Complex sentences – beware
 - Semitechnical vocabulary, Linkers – (re)learn.

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