

SEMANTIC DESCRIPTION OF SCIENTIFIC ENGLISH REGISTER

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ABSTRACT

In this article we try to show a mainly semantic description of scientific English register. As a result, some meaning changes are briefly analysed giving particular examples of their contribution to computing, mathematical or physical terminology, especially specialization, generalization, transferred or figurative use, metaphor, polysemy, synonyms and antonyms, apart from purely technical terms. In these briefly analysed semantic processes the features of impartiality, objectivity, clearness, coherence, accuracy, conciseness, informativeness and directness of scientific English register have been observed, as we show in the conclusion of the article.

KEY WORDS: Scientific English register, specialization, generalization, transferred or figurative use, metaphor, polysemy, synonyms, antonyms, purely technical terms.

RESUMEN

Este artículo pretende mostrar una descripción principalmente semántica del registro del inglés científico. Como resultado, analiza, de forma concisa, algunos cambios de significado con ejemplos concretos pertenecientes a la terminología informática, matemática o física, en especial la especialización, generalización, uso transferido o figurado, metáfora, y polisemia, sinonimia y antonimia, aparte de tecnicismos puros. En estos procesos semánticos brevemente analizados se observan características tales como la imparcialidad, objetividad, claridad, coherencia, exactitud, concisión y carácter informativo y directo del registro del inglés científico, como indica la conclusión del artículo.

PALABRAS CLAVE: registro del inglés científico, especialización, generalización, uso transferido o figurado, metáfora, polisemia, sinonimia y antonimia, tecnicismos puros.

1. INTRODUCTION

The examples in this semantic analysis are drawn from certain sources studied over a long period of research into the diachronic and synchronic linguistic analysis of specialized English lexicon, such as E. Weekley, 1967; *The Compact Edition of the Oxford English Dictionary*, 1971; *The Oxford English Dictionary*, 1978; C.T. Onions (ed.), *The Oxford Dictionary of English Etymology*, 1982; W.W. Skeat, *An Etymological Dictionary of the English Language*, 1985; *The Concise Oxford Dictionary of*

English Etymology, 1986; A. Freedman, *Diccionario de computación*, 1992 and *The Oxford English Dictionary*. 2nd ed. CD-ROM, 1993.

First of all, we must take into account what a register is. According to M.A.K. Halliday,

a register is a semantic concept. It can be defined as a configuration of meanings that are typically associated with a particular situational configuration of field, mode, and tenor. But since it is a configuration of meanings, a register must also, of course, include the expressions, the lexico-grammatical and phonological features, that typically accompany or REALISE these meanings. And sometimes we find that a particular register also has indexical features, in the form of particular words, particular grammatical signals, or even sometimes phonological signals that have the function of indicating to the participants that this is the register in question (1990: 38-39).

For example, medical students coming from overseas to English-speaking countries generally learn the technical language quite easily; but when they have to communicate with patients, they often have a great deal of difficulty, because this is a very different register, and one that is not taught in textbooks.

Therefore, we can define a register as a variety according to use. In other words, a register is what you are speaking at the time, depending on what you are doing and the nature of the activity in which a language is functioning. A register reflects another aspect of the social order, that of social processes, the different types of social activity that people commonly engage in. (Halliday 1990: 41).

A technical or specialized language is a formal variety of the standard general language whose main purpose is the transmission of truthful information about facts, opinions, beliefs and mental attitudes that form a part of social and cultural life, a characteristic that gives it denotative character. Some other of its basic purposes are accurate definition, conceptual analysis and discussion of specialized subjects in advanced levels of learning and scholarship.

Thus, a technical or specialized language is used by sciences, that is, pure sciences (e.g. philosophy, mathematics and physics), applied sciences (e.g. engineering, medicine and agriculture) and social sciences (sociology, anthropology and economics), and by the arts, industry, commerce, politics or religion.

In spite of the fact that the specialized groups preferably use such a variety of the standard language, it is also used in large areas of society, where many people are receivers but not transmitters. Such is the case of the language of the means of communication, commercial letters, reports, instructions and information in general.

Therefore, though a technical language is usually written and transmitted by means of printing, it is also used orally, especially since the application of the electronic means of communication (telephone, radio, television, etc.). This is the case of discourses, parliamentary debates, meetings of assemblies and committees, lectures, etc.

If we compare special languages with general language, the difference lies in the degree in which special languages strengthen or lessen the essential characteristics of general language.



If we merely consider language as such, a technical language may, on the one hand, give certain words special designations and, on the other, change words into terms, that is, determine them as univocal designations of exclusive classes; in fact, this normally happens in scientific language.

Technical languages are sub-systems whose aim is accuracy, effectiveness and prestige by means of morphosyntactic rules and a great deal of specific lexical unities, words or groups of words.

Many linguists have dealt with these special or technical languages. The study of these languages has become an important subject in present linguistic studies, as they are many and diverse: e.g. the language of aviation, commerce, computers, etc.

As J.C. Sager and D. Dungworth point out,

lexicon of special languages is their most obvious distinguishing characteristic... The extension of the frontiers of knowledge in science and technology in particular has been accompanied by the creation of a vast terminology necessary to describe the discoveries made and to express the concepts evolved in the course of this development (1980: 230).

The concept of technical language is definable in function of a specific vocabulary, since people with specialized activities need technical terms. According to Brenda Danet, "every occupational specialization has its own technical terms" (van Dijk (ed.) 1985: vol. I, 279), but it is difficult to delimit precisely the concept of "technical term". It may be defined as the specific terminology of an art, profession, industry, science or distinctive group, used by its speakers as members of that group and mainly characterized by its impartiality, objectivity, clearness, accuracy, coherence, conciseness and lack of emotion.

Moreover, a technical term may be a neologism. As G. Leech observes,

if neologism represents a type of linguistic creativity, it is the type of creativity that one finds supremely in the language of technology and of science, rather than in literature. Scientists are continually adapting and reordering their conceptual apparatus in order to give a precise explanation of what they observe (1977: 38).

Not only new names are necessary for new things when the knowledge borders are extended, but the modern science processes of ordering and classifying require a renewed vocabulary in honour of the greatest preciseness. For specialists, it is very important to define their terms clearly and discern them accurately.

Therefore, technical English requires specialized, elaborated, explicit and comprehensible lexicon. The more adequate the vocabulary, the greater the introspection in the subject to be discussed. This is the reason why scientific prose avoids literary adornments, dialectal forms, colloquialisms, etc., which will turn it from the established pattern.

Preciseness leads to abstraction, conceptual complexity and objectivity, since listeners' or readers' emotions are not required but their comprehension; with the result that common language resources are inadequate to make concepts and establish relationships among them.



2. SEMANTIC DESCRIPTION OF SCIENTIFIC ENGLISH REGISTER

From the *semantic* point of view, we must take into consideration the lexicon of scientific English register, the specialized terminology of every subject, which requires a vocabulary appropriate to the topics it deals with, special terms in order to denote the abstractions studied — processes, states, qualities, relationships, etc.— Many technical terms are classical loanwords introduced into English by means of literary or scientific works with abstract meaning in accordance with the scientific and technical concepts they denote such as names of new sciences, object qualities and conditions, etc.

Scientists are concerned with the exact, concise, coherent, clear and logical expression of their thought, as we have said, because their purpose is to inform, communicate ideas, not to cause emotion. Consequently, they give their words a precise meaning to avoid confusion and ambiguity.

The change of meaning in vocabulary is a basic feature in the history of the English language. In scientific English an ordinary word must modify its semantic range of application to become specialized. Its use may also be generalized, transferred or figurative and metaphorical, or it may become a word with several meanings, a synonym or an antonym; in other cases we find purely technical terms, that is, terms which do not need any semantic changes in order to be specialized because they are technical since their origin and only belong to the specialists' limited scope, they do not form a part of common vocabulary and are the result of scientific and technical specialization.

Meaning specialization or restriction is, according to G. Stern, “an adjustment of the meaning of the word to actual characteristics of the referent, or, more precisely, to actual characteristics of the referent as they are apprehended by the speaker” (1968: 404). On being specialized, a word gradually acquires more restricted meaning. Consequently, specialization allows English to endow its vocabulary with new or special senses, enriching it and avoiding its loss.

For example, nowadays the boom and dynamism of computing are shown in its English terms. The personnel associated with them rapidly adopts expressions of common vocabulary and terms in order to describe new techniques and advances in this technology. Therefore, the most outstanding semantic feature of these technical terms is the specialization of its previous general meaning, as in the case of the names which originally denoted a person, agent or profession such as *computer*, *cursor* and *printer*: *computer*, with the primary sense of ‘person that computes’ (1646: T. Browne, *Pseudodoxia Epidemica*: OED s.v.), came to denote, in the late 19th c., ‘the device which computes or calculates’ (1897: *Engineering*, 22nd of Jan.: OED s.v.); *cursor*, whose primary meaning was ‘runner’ (1566: T. Stapleton, *A Returne of Untruthes upon M. Jewelles Replie*: OED s.v.), is, in the 20th c., ‘one of several devices appearing on a VDU screen used to indicate position’, and *printer*, ‘the person who prints’ (1567: *Register of the Privy Council of Scotland*: OED s.v.), is extended in the 20th c. in computing as ‘a device for printing’. Thus, these terms lose a part of their preciseness, they are specialized in the restricted field of computing and always in that context.



Meaning generalization is produced when a word with specific meaning acquires more general meaning. When learned words acquire popular currency, they almost inevitably acquire at the same time new, less exact, meanings, or at least new shades of meaning. Technical terms may be generalized as a result of the increased influence of science and technology on everyday life and inevitably certain words and expressions are introduced into common language when inventions and discoveries are popularized. As G.H. McKnight observes, “familiarity with different sciences brings familiarity with their technical terms, and in this way learned classical terms find their way into the popular vocabulary” (1923: 116), as in the case of the English mathematical terms *interpolation* and *minimum: interpolation*, ‘the process of inserting in a series an intermediate number or quantity ascertained by calculation from those already known’ (1763: Emerson, *The Method of Increments: OED* s.v.), in general language denotes ‘insertion’ (1849: Murchison, *Siluria: OED* s.v.), and *minimum*, in *minimum value* of a function, i.e., ‘its value when it ceases to decrease and begins to increase, as the value of the variable changes continuously’ (1743: Emerson, *Fluxions: OED* s.v.), in common language indicates ‘the lowest amount or degree of variation attained or recorded’ (1823: J. Mitchell, *Dictionary of Mathematics and Physical Sciences: OED* s.v.).

Scientific English also uses figurative language in order to expand its lexicon. Thus sense expansion and metaphor are produced, “the first being a slow and gradual, almost insensible, process, the second the result of an instantaneous insight into the similarity of two objects, acts, etc”. (Nerlich 1990: 116). For example, in computing and other sciences such as physics, there are some terms which preserve their previous general meaning and acquire figurative use of it, such as the noun *friction*, ‘the force that makes it difficult for an object to slide over something’, adopted figuratively as ‘disagreement and arguments between people’, and *network*, ‘a system of lines, an arrangement of electrical components’, which also denotes ‘a large number of people, groups, institutions, etc. that have a connection with each other and work together as a system’.

In computing some common words are specialized by means of association, analogy or metaphor: e.g. *data*, which originally denoted ‘things given’, and nowadays it is referred to as ‘the information, usually in the form of facts or statistics that you can analyse, or that you use to do further calculations’.

The most frequent Old English words belonging to common language have been adopted by several technologies or sciences with special applications (Klasson 1977: 179). Thus, for instance, the nouns associated with the parts of our body have become multidisciplinary in acquiring technical senses: e.g. *eye* and *foot*. *Eye* (Old English “eage”) is used at present in architecture (‘a round hole or window’) and engineering (‘a wire loop or ring for a hook’) and *foot* (Old English “fot”), in botany (‘the absorbent and attaching organ of a young sporophyte’) and zoology (‘a muscular development of the ventral surface in molluscs’). Thus, these Old English terms become anthropomorphic metaphors, with figurative or transferred meaning apart from their literal sense, as in the case of *the eye of a needle*, *the hand of a clock* or *the tooth of a saw*. This figurative or transferred meaning results from a poetic, imaginary treatment of language.



The names of some animals are also metaphors of this kind: e.g. *crane* (Old English “cran”), which is used in engineering (‘a machine for raising heavy weights’) and photography (‘a travelling platform for a film camera’); *monkey* (Low German *moneke), in engineering (‘a large hammer for driving bolts’) and mining (‘the falling weight of a pile-driver’), etc.

When a noun has acquired a number of senses, it is probable that they have something in common, some analogy or similarity. For instance, in the technical uses of the noun coming from the animal kingdom *spider*, characteristics such as agility, leg length, etc., peculiar to this animal, are evoked in the definitions of the *Chambers 20th Century Dictionary*: ‘a light high-wheeled vehicle; a frying-pan, properly one with feet; any of various spider-like radiating structures, instruments, tools, etc.; a rest for a cue in billiards; an arrangement of elastic straps with hooks attached, used to fasten luggage, etc., on to the roof-rack of a car or on to a motor bicycle, etc.’

As to polysemy, according to S. Ullmann,

polysemy is the pivot of semantic analysis. Couched in synchronistic terms, it means that ‘one word can have more than one sense’. Translated into diachronistic terminology, it implies that ‘a word may retain its previous sense or senses and at the same time acquire one or several new ones’ (1951: 174).

Polysemy gives linguistic economy, flexibility and imprecision to scientific English in facilitating the creation of neologisms that permit that the same word refers to different notions and objects in every discipline or acquires several general senses. Many technical terms have several meanings on adding new senses without losing the original one: e.g. *current*, whose first meaning is ‘a portion of a body of water, or of air, etc. moving in a definite direction’ (1380: Wyclif, *Select English Works*: OED s.v.) and in electricity denotes ‘the transmission or flow of electric force through a conducting body’ (1747: *Gentleman’s Magazine*: OED s.v.), and *energy*, ‘force or vigour of expression’ (1581: Sidney, *The Defence of Poesie*: OED s.v.) and ‘the power of doing work possessed at any instant by a body or system of bodies’ in physics (1807: T. Young, *A Course of Lectures on Natural Philosophy and the Mechanical Arts*: OED s.v.).

In some other cases, apart from finding general and specialized meanings in a word, there are terms that, originally with a general sense, belong to several specialized fields at present: e.g. the noun *exit*, ‘departure’, belongs to the theatre lexicon —‘the departure of a player from the stage’— and computing terminology —‘the last instruction of a subroutine’—, and *input* means ‘power, or energy, or coded information, stored or for storage, information available in a computer for dealing with a problem, process of feeding in data’ in computing and ‘invested money’ in finance.

Complete synonyms are found in technical nomenclatures because scientific terms are clearly delimited and emotionally neutral. In English synonyms are produced mainly as a result of the acquisition of classical and French loanwords, which give rise to double and triple forms with three different levels in language



use: a popular general native form, which is more spontaneous, warmer, inner and less formal and pretentious, and a learned, abstract and even abstruse foreign technical form of Latin, Greek or French origin (e.g. *burn* (Old English “byrnan”) and *combustion* (Old French)), or a common popular native form, another more literary French form –with associations of status, class, refinement and elegance– and a third precise learned Latin form (e.g. *fire, flame and conflagration*). As G. Hughes points out,

the primary, basic or neutral word... will be Anglo-Saxon, forming the foundation on which a vast lexical superstructure of refinement and nuance is built, mainly from the registers of French, Latin and Greek... The Norman French terms will usually have associations of rank, courtliness and refinement, while the Latin and Greek will frequently have connotations of learning, science and abstraction (1989: 9-10).

For example, in computing we can find several cases of pairs of synonyms, one from Old English and the other from French: e.g. *input* (L. ‘in-’ and Old English ‘putian’) and *entry* (Old French ‘entrée’): ‘the information that is fed into an information-processing device such as a computer’; *to run* (Old English ‘rinnan’) and *to execute* (Old French ‘exécuter’): ‘to start a computer program and continue it until it finishes’; *to stand in line* (Old English ‘standan’, L. ‘in’ and Old English ‘lin’) and *to queue* (French ‘queue’): ‘to arrange data in a waiting queue’, etc., or one term from Old English and the other from Latin: e.g. *output* (Old English ‘ut’ and ‘putian’) and *exit* (L. ‘exire’): ‘the information which a computer sorts out and produces as the result of a particular program or operation’; *to restart* (L. ‘re-’ and Old English ‘stiertan’) and *to initialize* (L. ‘initialis’): ‘to start a system again’, etc. Therefore, the consequences of exchanging e.g. *to restart* by *to initialize* will imply a change of register, the foreign term being professional, technical, and the native one popularized, less technical and formal.

In computing terminology we can also find synonymous terms with the same origin, that is, native, French or Latin: e.g. *to offload* (Old English ‘of’ and ‘lad’) and *to unload* (Old English ‘un-’ and ‘lad’): ‘to discharge’; *garbage* (Anglo-Norman ‘garbage’) and *hash* (Old French ‘hacher’): ‘null information’; *memory* (Old French ‘memorie’) and *store* (Old French ‘estor’): ‘the part of the computer where information is stored’; *to compute* (L. ‘computare’) and *to calculate* (L. ‘calcare’): ‘to number or estimate, especially by using a computer or a calculator’; *to erase* (L. ‘eradere’) and *to delete* (L. ‘delere’): ‘to replace the data of a storage area with characters representing zero’, etc.

Consequently, the use of such synonyms in English is due to the great number of neologisms introduced into the language throughout its history and to its ductility because it lets an unknown word be explained or complemented by another more familiar.

Antonyms are opposite to synonyms, that is, words with meaning opposition. In scientific English there are two kinds of antonyms: grammatical antonyms, which are formed by means of prefixes, especially negative, and lexical oppositions



—e.g. *to activate* and *to deactivate*, ‘to increase or not the energy of a computer’—, and lexical antonyms, which delimit the real or apparent synonyms —e.g. *condensed (style)* and *extended (style)*, *(data) entry* and *(data) exit*, *hard (disk)* and *floppy (disk)*—.

Since Middle English, scientific English uses pure technical terms from their origin because of their clearness, accuracy, conciseness, informativeness and directness. In Contemporary English they are more frequent than in previous periods as a result of greater scientific and technical specialization. For instance, in computing terminology, there are technical terms coming from other specialized fields —e.g. *navigation*, ‘scanning of a database’ (from seamanship) and *palette*, ‘assortment or range of colours’ (from painting)— or they are applied to computing from the first to supply it with specific needs of its fast development —e.g. *bit*, ‘the smallest unit of information in computers and communications theory’; *database*, ‘a large body of information stored in a computer’, and *modem*, ‘an electronic device used to transmit and receive data as a frequency-modulated tone over a communications system’—. As C. Barber points out, “to-day we seem to be once again in a period of rapid vocabulary expansion. Some of the new words are names for new things, the products of modern technology” (1964: 78).

3. CONCLUSION

To conclude, the features of impartiality, objectivity, clearness, coherence, accuracy, conciseness, informativeness and directness of scientific English register have been observed in the briefly analysed semantic processes of lexical specialization, generalization, transferred or figurative use, metaphor, polysemy, synonymy and use of antonyms, and pure technicalities.



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