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TERMINOLOGY AND THE TECHNICAL DICTIONARY

Introduction

The title of this paper can be read as a question, a tautology, a provocation or a puzzle. The purpose of this paper is to point out the difference between terminology and special-language lexicography of which the technical dictionary is a type, and in the process to summarize the claims to disciplinary autonomy made by terminology.

It is a most unsatisfactory state of affairs that terminology is seemingly unable to solve its own terminological polysemies at the most fundamental level, so that 'technical dictionary' may be a synonym of 'terminology' which in its turn may be a synonym of 'special-language lexicography' or the more recently, but not yet fully accepted 'terminography'. These various meanings do not however exhaust the semantic range of the word. In its broadest meaning of 'the discipline concerned with terms' it must be considered controversial by lexicologists and lexicographers, as it creates a distinction between terms and words which is as yet not widely accepted.

I hope to show that 'terminology' is a useful concept around which to group methods and practices of special-language lexicography (is this the lexicography of LSP?); that it is sensible to speak of terminology as a separate discipline without encroaching upon the domaine of lexicology and general lexicography (a lexicology of LSP?); and finally that some lexicographers are also terminologists but not all terminologists are lexicographers.

But how has terminology developed as a separate activity and field of study? One answer is to say, by neglect from linguistics; a complementary answer is, by the different background of people who first engaged in this activity. The first terminologists in the modern sense were scientists and engineers.

It is by now unfashionable to quote or refer to the god-father of terminology, Eugen Wüster. He was, however, a modest and cautious man who chose his German words carefully. His misfortune was to be self-taught in linguistics, which makes his expression sound quaint to our ears; to have been inadequately understood, unwittingly or deliberately, because people wanted to generalize what for him was particular, and hence have mistranslated his work into modern German and other languages. In 1974 Wüster defined his allgemeine Terminologielehre, which is not quite the same as 'theory of terminology', as a border area between Linguistik, Logik, Ontologie, Informatik and all other disciplines which he called Sachwissenschaften. He further defines 'border area' by declaring terminology a branch of applied linguistics. Elsewhere (Wüster 1979) he paraphrases terminology rather narrowly as the rule system of the vocabulary of special-subject languages (my translation of the German Fachsprache) and lists the following

differentiating criteria:

(a) terminology starts from concepts and associates them with terms;
(b) terminology proceeds synchronically;
(c) terminology accepts the notion of language planning, i.e. standardization;
(d) terminology is interlingual;
(e) terminology is predominantly concerned with the written language.

We conclude that terminology is a wider concept than special-language lexicography and that it influences special-language lexicography.

Special languages and terminology

For an explanation of the point of view of terminology it is useful to consider the difference between 'natural' and 'artificial' language. Natural language evolves historically, i.e. it has to be adjusted to our needs for expression and consequently the relations between the content and the form of expression undergo changes, leading to such phenomena as homonymy, synonymy, quasi-synonymy and polysemy. Artificial languages, on the other hand, are constructed to permit an unambiguous attribution of designations to concepts. They are consequently restricted to use in precisely defined circumstances and cannot be changed through usage, e.g. programming languages, chemical formulae, biological taxonomies.

In general language usage polysemy is seen as a positive element. Special-language communication attempts to reduce the ambiguity of natural language by introducing features of artificial language, especially by fixing the relation between a concept and its associated term (definition) and by particular techniques of word-formation. In this way special-subject languages do not only become subsets of natural language, but they add elements not contained in general language (new meanings, new words and rules for their formation). This does not mean that special languages are artificial; they are used like natural language, but there is a new tension between the tendency immanent in natural language to create homonyms and synonyms and to extend the meaning of words, on the one hand, and the tendency of artificial languages to create unique designations firmly fixed in their place by definition and measurable distances to other designation, on the other. There is thus a greater, conscious and deliberate effort of regularization of designations (cf. Sager et al. 1980).

Wersig (1976) defines terminology as the designations of special-subject languages which are differently fixed from the vocabulary of general language, i.e. a subset of the lexicon which contains elements not contained in the general vocabulary. He also proposes a division of labour, saying that lexicography descriptively examines the current state of the lexicon and its usage by recording existing designations and their meaning. He sees the role of terminology as establishing firm relationships between concepts and designations, by determining, if necessary prescriptively, which designations should be used and how they

should be used.

These observations lead to several points we must discuss separately:

(1) terminology is concerned with special-subject languages and must therefore be in a position of subdividing the lexicon;
(2) terminology has a practical function of guidance in usage for which it needs to examine existing usage; in its 'terminographic role' it has a teaching function;
(3) terminology is strongly involved in the creation of new designations and is therefore interested in a theory of active, productive word/term-formation.

While not all these issues affect the production of technical dictionaries - in some cases they are even potentially dangerous for dictionary compilation - they indicate the possibilities of a likely separation of function between terminology and special-language lexicography.

Subject fields and knowledge structure

The practice-oriented origin of terminology is reflected in its fundamental assumptions and working methods. Examining separate 'subject fields', it sees the lexicon as many separate sub-systems related to the knowledge structure of each subject field or discipline. It can therefore use as its starting point the conceptual structure of an area of knowledge (cf. Rondeau 1981).

The boundaries of fields and sub-fields are determined by the conventional divisions between subject areas established by society from time to time. Social conventions determine what is general and what is special knowledge, as we can see in the subjects of school or university curricula, what is an academic discipline, what is a craft or a hobby. Scientific and technological changes introduce different groupings so that words like noise or entropy occur in the vocabulary of such different disciplines as electronics and linguistics with quite different definitions and conceptual relationships; even a substance like ferric chloride ($FeCl_3$) exhibits different conceptual relationships according to whether it is used as a mordant in textile technology or for building printed electronic circuit boards and thus may be classified and defined differently (cf. Johnson and Sager 1980).

This is what is meant by the 'onomasiological' approach. Subject specialists and now increasingly terminologists single out the concrete or abstract entities, processes, products or states relevant to a particular field and then look for the name or names by which they should be known. Unlike Bishop Wilkins and other philosophers in the 17th century who attempted to create rather idealized classification systems on the basis of a top-down approach, leading to a universal language - they were also forerunners of terminology standardization - today's terminologist uses a bottom-up approach and is therefore concerned with many sub-languages and sets of single items of knowledge and the conceptual relations that hold between them.

Starting from limited domains, terminologists build up complex

systems of concepts which eventually intersect and overlap. Problems arise at the intersections of subject areas, as they do in general lexicography between the words which one assumes as belonging to the common core and which require a subject label, and in subject attribution itself. The bottom-up approach permits the practical terminologist to avoid subject classification altogether, as he is principally interested in the immediate terminological or rather conceptual relationships; it is these relationships which determine a single or a multiple structure for his work. In practice he works on a corpus of written and spoken language, e.g. a broad area of work, a product description, a manual of operation, a set of documents related to a process. He is guided by social, academic or industrial conventions and leaves the problems surrounding the conflict between subject classification and text classification to the theorists. A glossary is by its nature confined and user-oriented, i.e. it has a limited domain and limited use.

We have in this way referred to an important aspect of terminological work. It is task-oriented and requires close collaboration between subject specialists and terminologist. In this connection I can refer to the interesting approach to product documentation and incidentally terminological work at Siemens in Munich. Simultaneously with the development of a product the terminology is collected, harmonized and made available to the technical writers and translators who must have the documentation available virtually at the same time as the product is ready for marketing. I understand that translation companies increasingly also compile terminological glossaries before embarking on large translation contracts. This leads us to the interesting notion of document-specific terminology in contrast to subject-specific terminology.

Such work may not conform to the standards expected of special-language lexicography as it may abound in translation equivalents and ad hoc creation of terms, but it can be considered as preparatory to special-language lexicography as the ground rules are the same. Terminological work of this sort is extremely widespread and greater awareness of the issues involved may lead to cooperation between lexicography and terminology and so to the improvement of such work.

Another consequence of the onomasiological, conceptual approach **which often** arises from practice is the tendency to create multilingual glossaries. Starting from definitions of scientific or technical concepts which are considered language-independent, it is possible to determine the names for concepts in all those languages which share the same degree of scientific and technical evolution. Many international organizations issue multilingual glossaries without the basis of monolingual glossaries. Export-oriented firms constantly have a need for foreign-language terminology, however restricted or tentative such terms may be. The earliest modern example of a conceptually based technical dictionary, the monumental ILLUSTRIERTE TECHNISCHE WÖRTERBÜCHER of Schlomann (1906-1928), appeared in English, French, German, Italian, Russian and Spanish, and Wüster's own dictionary, THE MACHINE TOOL, was based on standard documents in English, French and German. The increasing transfer of technology between nations

and languages creates a strong demand for multilingual terminology and entails the risk of inappropriate term creation.

The wider conclusion we can draw is that terminological practice is heavily user-oriented, fragmented and carried out by large numbers of people with little formal training. Only in recent years, with the creation of term banks and terminology commissions are attempts being made to introduce guidelines for good practice. The growth of concern with LSP teaching has also contributed to a greater awareness of the issues and problems involved.

Definitions and relationships

The concepts of any one area are fundamentally described in three ways: (a) by definition, (b) by their relationships to other concepts, and (c) by the linguistic forms, the terms, phrases, or expressions by which they are realized in any one language.

The use of definitions is time-honoured and on the surface uncontroversial. In practice, however, it raises the problem of user orientation, i.e. the degree of specialism, exhaustiveness and, of course, space in the dictionary. This can be illustrated by the three definitions in an entry from the CHAMBERS DICTIONARY OF SCIENCE AND TECHNOLOGY:

E_1: Phosphorescence (chem.) the greenish glow observed during the slow oxidation of white phosphorus in the air.
(phys.) a glow emitted by certain substances after having been illuminated by visible or ultraviolet rays. It may be regarded as fluorescence which persists after the exciting radiation has ceased.
(zool.) luminosity; production of light usually (in animals) with little production of heat; as in glow-worms.

The terminologist is less concerned with these difficulties of choice, as he usually works for a more specialized user; nor is space a serious obstacle with increasing automation and possibilities for selective recall. He needs existing contextual definitions to verify the concept and store it as one context. This definition fixes the intension, the precise reference of a term, and it varies from the extreme rigour of definition in the close systems of reference of the taxonomies and other highly artificialized languages to the flexible definition in innovative technologies where functional characteristics are more often used than formal or material ones. (Telephones or direction indicators of motor cars, for instance, are not what they used to be, but are still called by the same name.) But such an 'external' definition may not fit the requirement of a particular user group, as it may be too specific or too broad to match the subject classification proposed. He may therefore have to construct a 'terminological' definition in order to place the term in its appropriate knowledge structure. This work presupposes an understanding of the intension of a term which is gained from existing definitions, from contexts, from consultation with specialists and through subject knowledge. It serves to single out the essential characteristics of the conceptual field and to delineate the extension by reference to other terms.

The system of concepts which underlies any terminological work is not constructed ad hoc on every occasion but bases itself on existing definitions and generally perceived relationships. Certain categories of concepts and terms are therefore taken as the general framework on which to build. These are:

(a) Terms referring to observable physical entities. Chemical substances, plants, minerals, etc. do not require definitions as they are well known and defined elsewhere; they do have different functions in different subject fields and may require a functional supplementary definition.

(b) Terms referring to scientific methods of analysis and description do not require definition as they are well-known and rarely cause misunderstanding.

(c) Terms referring to properties relevant to established scientific and technological processes are usually adequately defined, e.g. measurements.

(d) Terms which are standardized are already defined and in most cases also classified as to their position in a terminological structure, because standardized vocabularies are usually systematically structured.

All these terms can be considered as points of reference necessary for fixing the reference of other terms (cf. Sager 1982).

This leaves the large number of terms designating other entities, concrete or abstract, manufactured products, industrial processes and relevant properties which are less rigidly fixed in the knowledge structure and which rely on a broad consensus among users for the confines of special reference associated with them. Some of these have a very limited reference in a small area of usage, e.g. product definitions in lists for customs tariffs. Such definitions have to be taken over together with an indication of their area of applicability. Normally, however, a definition of these terms can never be exhaustive because, if any prescriptive function were to be associated with the definition, this would amount to standardization. A definition may nevertheless be considered desirable in order to circumscribe the area of reference of the term. In such a case it is advisable to choose a listing method of the features of reference which are considered to be essential for location of the term in its environment, a type of meta-language of definitions.

Such a process of listing essential features of a concept complements that of fixing the term in relation to others in the immediate field and can adopt some of the techniques developed in information science for identification of descriptors, such as factoring, scope notes, qualification and facets. The method and its purpose are clearly signified by calling them 'terminological'. The present known field of reference is established as that of the narrow subject field without any prejudice to a widening, narrowing or shifting of meaning within the knowledge area so signalled. It is also clear that such a method would not be suitable for the four other categories of terms listed above.

We can conclude that terminological definitions may be conveniently applied to those terms which are not already clearly defined and which are therefore likely to require further

specification in addition to the declaration of terminological relationships.

In terminological theory it is accepted that terms should be classified and presented in a thesaurus structure. The flexibility of data selection and presentation in modern automated terminology permits displays of terms surrounded by their broader, narrower and related terms. The usefulness of this type of display has been demonstrated in documentation thesauri but also in such pioneering works as Wüster's MACHINE TOOL DICTIONARY. There is also a tendency in documentation thesauri to permit consultation for terminological purposes, e.g. in the new ROOT THESAURUS OF THE BSI and the CONSTRUCTION INDUSTRY THESAURUS. Other thesauri make similar claims (cf. Nikitina 1979).

The relationships among terms contain defining elements as shown by such simple statements as the following which underly the symbolic representation of BT (broad term), NT (narrow term) and RT (related term):

x is a type of y
x is a part of y
x is related to y

Such statements can be generated automatically by a computer which converts this kind of information into a simple definition. It is equally possible to generate automatically expanded defining statements such as:

x is a type of y together with z and q
x is a part of y; other parts are z and q
x is related to y and so are z and q

Moving further up, down or diagonally across the relationships, expanded statements, e.g. for giving the top or bottom terms of a hierarchy, are equally possible (cf. McNaught 1982).

Graphic forms of display as developed for documentation thesauri may also prove useful in the representation of the semantic networks of terminological systems, e.g. the EURATOM THESAURUS.

A close link thus exists between definition and the placing of a term into its environment; defining a term can be synonymous with fixing its identity in relation to other terms. This work of declaring and representing terminological relationships can still be considered to be in its infancy. The basic relationships of 'generic-specific', 'part-whole', and 'related' which are generally found in existing textbooks and glossaries are only the crude beginnings of the possibilities opened up by using computers to trace the representation of the nodes and labels attached to relationships in semantic fields.

On a practical level it is important to devise simple methods for achieving accuracy and consistency in the attribution of a limited number of relationships which are most informative for the end user. It is then also a relatively easy step to use information automatically extracted from a terminological data-base

for the formulation of user-friendly machine-generated definitions.

A user enquiry conducted in 1980 (cf. Sager and McNaught 1981) showed that users of specialized dictionaries were strongly interested in being able to extract such definitions from term banks. The question currently to be answered is: which defining patterns can provide the maximum amount of relevant information to all specialized users? This work is not unknown in general lexicography, but appears to be most advanced in terminology and likely to prove most useful in specialized lexicography.

In practice the terminologist is faced with a number of direct problems which can only be briefly cited and exemplified here.

(1) Adopting the onomasiological approach and the notion of special-subject fields, any one field has to be delimited from other fields and from words of the general language. Criteria are needed for making these decisions. In the absence of generally valid, theoretically well-founded guidelines, the terminologist responds to user requirements. The problem of sub-classification of data-bases can solve the user problem only partly, and the fact that the greatest divergence among existing term collections lies in subject classification shows that this is a major problem.

(2) While serious terminological work is now closely associated with automated processing which makes storage less of a problem, the questions about the relevance of items of information is still unresolved. One major area of concern is the selection of sources. Can one, for instance, resolve the problem of synonyms by consulting a variety of sources (e.g. in machine-readable form) to establish preferred usage through frequency analysis?

(3) Having established a conceptual structure, the terminologist has to find the linguistic forms which exist and select the appropriate terms. One could say that at this stage he begins to work like a lexicographer. He can work on a limited corpus and the selection of a corpus is perhaps easier than in general lexicography. The selection of terms from the corpus is, however, very difficult. Let me quote a few examples from a very limited corpus, part of an M.Sc. thesis which examines this problem (Hope, forthcoming). How does one select the term for a concept when in one and the same text one finds three or four alternative designations for compounds?

Gearbox end cover plate - end cover - cover.
External full flow oil filter - external oil filter - oil filter.
Layshaft ball journal bearing - ball journal bearing - layshaft bearing - bearing.
Fabric oil filter element - fabric filter element - oil filter element - filter element - element.

Such cases of synonymic variation are not rare and while we can dismiss the very long ones as catalogue items and the very short ones as contextual reductions, there is enough variation in the middle to require not only consultation with experts, but in some cases a declaration of preference amounting to agreed prescription.

Another area of discussion is the relative value of definition, context and usage labels. The idealistic days of belief in univocity (one concept/one term in all written contexts) are gone, and a clearer distinction is now being made between the functions of monolingual and bilingual terminology.

The most controversial element of information, however, is still the quality of indicators. It is well known that many term banks use reliability or quality indicators and scales of up to five values to differentiate such categories as 'standardized terms', 'well established terms', 'terms found in a limited range of documents', and 'terms created for the occasion of a translation'. While admiring the scruples terminologists seem to have in such matters, one may nevertheless question the validity of such categories as distinct from usage labels. This phenomenon differs clearly from lexicographic practice and shows the nearness to the word or term-face in which a terminologist has to work and the supporting role to translation which forces him into this position. Much translation is concerned with scientific and technological innovation, and it shows great progress in translation that the need for expert advice in term formation is being recognized.

Terminologists can thus be seen to work in two modes:

(a) the systematic exploration of terminological fields which leads to specialized dictionaries or their modern counterparts in term banks;

(b) the task-specific development of mono- or multilingual sets of terms for a particular need.

It is equally clear that the conscientious terminologist will wish to have worked systematically in the area in which he may be called upon to establish a bilingual equivalent.

Prescription

We have returned to the most controversial aspect of the work of terminologists, that of new coinage and prescription. Any innovation or imposed change on usage is however subject to a number of basic constraints which determine the success or failure of such work and thereby control the work of terminologists. In order to serve its purpose, terminological intervention must take account of existing usage. While terminological intervention aims at correcting inappropriate usage, what is appropriate can only be determined by reference to the knowledge space of a special subject area and its systematic conceptual structure. Any successful prescription depends on respect for established usage and a clear knowledge of the theoretical structure of the conceptual field. If neither are consolidated, the terminologist can at best develop the alternatives and offer them without any commitment.

Prescription of terminology is therefore always based on compromise; thus the terminologist's work moves between the descriptive work of the lexicographer and the prescriptive work of the standardizer or linguistic rule maker. A good terminologist does not prescribe any more than a lexicographer. He makes suggestions which others have to accept and implement or reject.

Let me sum up this part of my survey by listing the requirements of good practice in terminology which may equally apply to special lexicography:

(1) The compilation of terminological collections starts with an examination of the existing specialized lexis in the narrow subject field. This is complicated as much vocabulary is highly specialized and innovative.

(2) Terminologists should proceed systematically from conceptual fields to designations. This is not an open invitation to build fanciful hierarchies and classification systems, which has rightly been criticized by Wiegand (1979), but rather a necessity based on practical observation. Only the exploration of a particular domain of special knowledge can provide the precision required for delimiting the meanings of closely related terms. This work requires a practical orientation; and we therefore come to the third requirement.

(3) The terminologist must work in close conjunction with subject specialists. He must know the subjects he is dealing with as well as neighbouring subject areas. Most work in terminology is therefore carried out by teams as the range of knowledge and experience required is rarely possessed by one individual.

(4) Terminologists can play an active role as linguistic advisers by showing up weaknesses in the system of designations and by proposing sensible methods of designation and term formation. The Canadian experience of 'Francization' has shown the scope but also the limitations of this role.

Conclusion

To conclude, let me present some information on the institutional side of terminology. It started with the preoccupation of standardizing institutions to issue glossaries of terms used in national and international standards. This work showed the need to standardize the designations for the standardized objects, processes and methods and resulted in standardized glossaries of which ther are some 8000 in existence. Having realized the importance of language to their work, international bodies like ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission) and national organizations, notably the standards institutions, began to issue guidelines for the naming and definition of technical terms (e.g. BS 3669).

ISO issued a number of recommendations in the late 1960s, largely under the influence of the late Eugen Wüster. They dealt with such items as

ISO/R 704 - 1968 Naming Principles
ISO/R 860 - 1968 International Unification of concepts and terms
ISO/R 919 - 1969 Guide for the preparation of classified vocabularies
ISO/R 1087 - 1969 Vocabulary of terminology
ISO/R 1149 - 1969 Layout of multilingual classified

vocabularies
ISO 1951 - 1973 Lexicographical symbols, particularly for use in classified defining vocabularies

These documents were first and foremost destined for ISO itself as guidelines for the production of glossaries supporting international standards. Ten years later a revision was considered necessary and ISO Technical Committee 37 is currently engaged in this work. Like all work on standards this revision proceeds extremely slowly as many national views have to be reconciled, meetings are infrequent, attendance by national delegations is irregular and the language barrier causes considerable difficulties. In the course of events an important meeting in Vienna in 1980 considered that these guidelines were not only appropriate for processing standardized terminology, but would be equally useful for all kinds of specialized dictionary work. This enlarged the scope of the proposed guidelines, requiring wider consultation and consequently further delays. Some countries have in the meantime developed their own updated guidelines, thus on the one hand removing the pressure on international cooperation and on the other introducing new pressures in the wish to see the international standards modelled as closely as possible on the national documents. In the meantime the production of glossaries proceeds as best it can.

On the positive side, the need for an information centre on terminology was recognized by the UNISIST programme of UNESCO, and INFOTERM was established in Vienna in 1971, largely as a result of the efforts of Eugen Wüster. This small underfinanced and understaffed centre has carried out considerable work and has an ambitious programme. It has an impressive list of useful publications (i.e. the Infoterm series published by Saur, Munich) consisting mainly of proceedings of conferences and symposia and the most valuable International Bibliography of Standardized Vocabularies. It also issues quarterly Newsletters which are reprinted whole or in part by Lebende Sprachen, the International Journal for Classification and Multilingua. Its role as information centre requires it to collect information, and it has built up an impressive collection, especially of 'grey literature' which is not otherwise obtainable.

More recently, Infoterm has developed the TermNet programme which gives it the role of coordinator and focal point for a network of terminological activities. A number of meetings and conferences have been held and TermNet News with a circulation of 1000 copies spreads practical information on terminology. Most active in this venture are the existing term banks some of which are already cooperating independently. The latest effort of the TermNet programme is the development of a unified term record format both as a model for new term banks and to facilitate exchanges of records. There is also in existence a standards proposal for an exchange format for lexicographic data on magnetic tape which may shortly become an international standard.

Canada is very active in the field of terminology. There are two large terms banks, courses in terminology and active postgraduate research at several universities and regular publications and conferences. The proceedings of a large number of

symposia on particular aspects of terminology are less well known.

The European term banks are well known for their active support for the development of good terminological practice. The most recent development is the creation of the International Association of Terminology, TERMIA. An international conference is planned for the end of August 1984.

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