

GUIDE TO THE UNIVERSAL DECIMAL CLASSIFICATION (UDC) 025.45

B.S. 1000C: 1963

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**GUIDE
TO THE
UNIVERSAL DECIMAL
CLASSIFICATION
(UDC)**

**B.S. 1000 C: 1963
(F.I.D. No. 345)**

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The UDC was originally derived from the 5th edition of the Dewey DC and the schedules outlined in Section Two of this Guide also incorporate material published in various later editions of DEWEY DECIMAL CLASSIFICATION © 1911, 1913, 1915, 1919, 1922, 1927, 1932, 1942, 1951, 1952 and 1958 by Forest Press, Inc., Lake Placid Club, N.Y.

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FOREWORD

Prepared at the request of the Library Association Reference and Special Libraries Section for a concise, practical guide to the Universal Decimal Classification (UDC), this booklet will, it is hoped, provide librarians, information officers, students and others with an informative commentary on the principles, application and utilization of this internationally recognized system.

The essence of the Guide is in the first section, contributed by Mr. J. Mills, a leading British expert on classification and member of the British Standards Institution's national UDC committee. In his clear and thorough way, the author outlines the modern theory of classification and examines the practical problems of classifying by means of the UDC, concluding his contribution with a list of further reading. The second section comprises an outline of the UDC tables which, with the full schedule for 543, should serve to illustrate the scope of the system and to supplement the first section, though a poor substitute for a set of full tables or even for B.S.1000 A (the shortest abridgment suitable for practical classification). The last section contains, by way of general information, a list of several hundred UDC users (mainly British)—selected from among the many thousands throughout the world.

The UDC, originally derived (in its main structure) from the Dewey DC, differs in its auxiliary notation of distinctive symbols (pp. 52-57), which enable complex subjects to be designated, classified and retrieved in terms of their component features—often independently classifiable—and which substantially reduce the need for repeated enumeration of similar concepts in different subject fields. It is because of this general approach, which treats all knowledge as an integral pattern of more or less related concepts, and not for its undoubted international use and reputation, that the UDC is described as "universal".

Under the auspices of the Fédération Internationale de Documentation (FID, 7 Hofweg, The Hague), international UDC editions are prepared and published in many different languages by accredited national organizations which in Britain, Germany and Spain are also the national standardizing bodies, the full English edition B.S.1000 (in course of publication) and the Abridged English Edition B.S.1000 A are published with the concurrence of Lake Placid Education Foundation, publishers (through Forest Press) of the Dewey DC and Dr. Melvil Dewey's successor to the copyright in the original DC.

To keep this comprehensive system reasonably abreast of advances in knowledge, there is an international network of UDC revision committees (working under the general supervision of the FID and its Central Classification Committee—CCC), results of whose work are circulated, first as drafts and then as formal proposals (P-Notes) to participants and other specially interested subscribers. So often, however, are these modified before final authorization that users are recommended to rely on the cumulative "Extensions and Corrections to the UDC", issued half-yearly in February and August, as their regular supplement to printed editions. All organizations and individuals interested in developing the UDC are entitled to participate in this activity, preferably through their national UDC office or committee, and the B.S.I., as the responsible British body, will welcome constructive proposals from readers of this Guide or others interested.

For further information on the history and background of the UDC, the work of the pioneers like Otlet and La Fontaine, Donker Duyvis and Bradford, and the organization and activity of the FID and its special committees, the reader is referred to the Introduction to B.S.1000 A, to the reading list on page 47 and to the survey of UDC editions, page 48.

March, 1963

Some of the details mentioned above (most of Sections Two and Three) are out of date and have been deleted. Section One is retained mostly unaltered: it should be noted that some of the examples given (especially those referring to class 4, now cancelled) are no longer applicable, but the principles described remain valid. For classification, users should refer to a current edition.

*As amended
Dec. 1979*

February, 1979

SECTION ONE

GUIDE TO THE USE OF THE UDC

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1. THE FUNCTION OF CLASSIFICATION IN THE LIBRARY

1.1 A library is a store of information. The documents in it are there because they convey information on some subject, not because they are by a particular writer, or published by a particular firm, or bound in a nice cover. A vital part of the work of any librarian or information officer is to be able to retrieve information from this store, rapidly and with confidence.

1.2 Without some kind of **organization** of the stock according to its subject matter, a request for information means that every document in the collection must be scanned if nothing relevant is to be overlooked.

1.3 By establishing clearly demarcated groups or classes of documents on related topics, the number of documents to be scanned can be reduced to feasible proportions, since those in clearly irrelevant classes can be safely ignored.

1.4 The decision to **classify** the documents immediately raises two problems. First, what classes shall be established? Secondly, how far shall the breaking up process go? For if the classifying is too fine, there is a danger that relevant documents will be overlooked as a result of over-confidence as to what can be ignored.

1.5 The documents themselves can rarely be arranged in one classified sequence by subject. Their physical format (very large or very small books, unbound reports, pamphlets, microfilms, plans, correspondence, etc.) alone makes this impossible, but other factors also prevent it; for instance, periodical sets are probably kept together as are series of reports. So documents are represented by catalogue (index) entries, which may be arranged in one consistent file and by which search for relevant documents is first made.

From now on it will be assumed that the problems of using the UDC are primarily problems of cataloguing (indexing), and it is catalogue entries that will be in mind when 'documents' or 'subjects' are referred to.

2. THE CLASSIFIED CATALOGUE

Before looking at the problems of using the UDC in detail, it may be helpful to give a brief description of the traditional form taken by the classified catalogue as an instrument for document retrieval—i.e. the form envisaged by Melvil Dewey, whose scheme (the first modern library classification) was the precursor of the UDC. A classified catalogue has three separate files:

2.1 THE CLASSIFIED FILE

Here, entries for the individual documents are given, arranged in classified order—i.e. on the top of each entry is the class number, and filing is by this. The following example lists a selection of such headings, each one representing one or more document entries on the subject. Note also that indentation is a symbol of subordination, e.g.

Agriculture
Plant husbandry

means that plant husbandry is a division of (subordinate to) agriculture.

63	Agriculture
631/635	Plant husbandry and forestry
631.1	Farm management
631.3	Implements, machinery
631.31	Soil working machinery

631.312	Ploughs
631.5	Operations
631.52	Selection, propagation
631.55	Harvesting
632	Diseases, pests and their control
633	Field crops
633.1	Cereals, grains
633.1-13	Implements, machinery
633.1-15	Operations
633.1-152	Selection, propagation
633.1-155	Harvesting
633.1-2	Diseases, pests
633.11	Wheat
633.11-13	Implements
633.11-2	Diseases, pests

Three features in particular should be noted:

2.11 Related subjects are brought together in a systematic fashion; for instance, under Technology (Class 6) all aspects of **Agriculture** are collected and grouped into categories such as Equipment, Operations, Processes (e.g. Diseases) and Crops.

2.12 But some related subjects are not brought together; the relation between them is not displayed by the classified sequence, thus Machinery used for cereal crops is separated from Agricultural machinery used for other crops, and documents on Harvesting Methods in general [631.55] do not include those dealing with specific crops [*cf.* 633.1-155]. Generally speaking, each document gets only one entry in the classified file, and this method of 'single entry' is assumed for the time being. Many UDC users, however, favour a method of 'multiple entry', whereby a document on Harvesting of cereals, for instance, would get an entry under both Cereals and Harvesting. For clarity, this method is described separately (in section 8) and is not considered here.

2.13 The sequence of classes is maintained by a notation—i.e. a system of symbols which either possess an ordinal value, to indicate position (e.g. 1 to 9), or which have been given an ordinal value (e.g. the hyphen -, which files before a number).

2.2 THE A/Z SUBJECT INDEX (*See also* 7)

This does not contain entries for individual documents, but only references from the names of subjects to their notational symbol (class number), e.g.

Agriculture	63
Agriculture:economics	338:63
Agriculture:wages:economics	331.2:63
Cereals:agriculture	633.1
Diseases:agriculture	632
Diseases:cereals:agriculture	633.1-2
Diseases:wheat:agriculture	633.11-2
Grain:agriculture	633.1
Harvesting:agriculture	631.55
Harvesting:cereals:agriculture	633.1-155
Harvesting:wheat:agriculture	633.11-155
Wheat:agriculture	633.11

The main function of the index is obvious. It is a key to the location of topics whose whereabouts, even in a carefully classified sequence, will not be necessarily as obvious or easy to determine otherwise.

A second major function of the A/Z index is to draw attention to those connections between subjects which the classified sequence (of the document entries in the classified file) does not show, e.g. between different aspects of Agriculture, of Diseases in agriculture, of Harvesting. Such an index, which shows the relative aspects from which a topic is treated, is called a *relative index*.

2.3 AUTHOR/TITLE INDEX (A/Z)

Like the classified file, this has entries for individual documents. But these entries are filed under authors and titles arranged in one alphabetical sequence. The title entries might include, for example, those of series—of reports, say—which may be further arranged numerically if need be. On each entry will appear the class number (showing location in the classified file) and shelf location mark (if it is different).

If desired, the two A/Z indexes can be interfiled to make a single A/Z index, although this is not recommended. To ensure complete flexibility in adding and withdrawing entries all three files are usually kept on cards, although other physical forms are possible.

3. SOME ESSENTIALS OF LIBRARY CLASSIFICATION THEORY

3.1 PRINCIPLES OF DIVISION (CHARACTERISTICS)

Classification is the grouping together of like things and their separation from unlike things. The central theoretical problem of classification as a method of organizing documents is that only one principle for collecting items together can be recognized at a time. The class to be arranged is first divided by one principle of division (characteristic); for instance, Metallurgy may be divided by the characteristic Metal to give such subclasses as iron, gold, aluminium and copper. A second characteristic (e.g. Property) may be applied to each of these subclasses to give further subclasses such as mechanical properties of iron, thermal properties of iron, etc.; mechanical properties of gold, thermal properties of gold, etc., and so on.

If this order of applying characteristics of division were followed, documents on a given metal would be kept together, those on a given property would be scattered. On the other hand, if division were first by property and second by metal, then documents on a given property would be kept together while those on a given metal would be scattered.

3.2 ORDER OF APPLICATION (CITATION ORDER)—PRIMARY AND SECONDARY ASPECTS

The classical approach to this problem in general libraries and in such general bibliographies as the British National Bibliography (B.N.B.) is this:

3.21 An order of application of principles of division (usually referred to as 'citation order' or 'facet formula'—see 4.23 and 4.3) is decided, which will keep together those aspects of the topic that are considered to be of most significance. To take an obvious example: in classifying Linguistics, division is first by language, second by linguistic problem. So all works on one language are kept together, and this clearly reflects the normal approach to the study of linguistics. But works on a particular linguistic problem will be scattered under various languages, e.g. English prepositions under English language, French prepositions under French language.

3.22 The location of these scattered problems ('distributed relatives') is shown by an A/Z subject index, as explained in 2.2 above.

3.23 Clearly, the retrieval of documents on a secondary aspect (i.e. a 'distributed relative') is more difficult than retrieving those on an aspect for which entries are

kept together. For A/Z subject index entries are not document entries, but only references to the location of classes. The actual document entries on Prepositions, say, will only be found by looking up separately the various language groups to which they are subordinated.

How feasible this is will depend on the number of these scattered locations and on how often a searcher wants *everything* on the topic. For example, if the normal request is for prepositions of a particular language, the location of this can be determined very rapidly (e.g. by an index entry Prepositions: French language 440-2) and the scattering of entries proper is relatively unimportant. This condition does, in fact, hold for many document collections.

3.3 LIMITED VALUE OF DISTINGUISHING PRIMARY AND SECONDARY ASPECTS

But in many, perhaps most, special collections, to draw a distinction between the primary aspect (on which everything is kept together) and secondary aspects (on which entries are scattered to some extent) is of limited value, in that the interests of the users are not centred on one aspect more than another. For example, an enquirer might be as likely to request all entries on a particular metallurgical property (e.g. thermal) as on a particular substance (e.g. aluminium).

3.4 DUPLICATE AND MULTIPLE ENTRY (*cf.* section 8)

Because of this, it is very common for UDC users to duplicate entries for a document on such a compound topic and to file one entry under the first element in the compound and another under the second.

Similarly, if a topic deals with three different factors (e.g. the influence of Fertilizers on the Vitamin B content of Wheat), entries are triplicated and one entry filed under each factor, to give three different citation orders:

Wheat—Vitamin B—influence of Fertilizers
Vitamin B—influence of Fertilizers—Wheat
Fertilizers—influence on Wheat—Vitamin B.

Theoretically, this still provides only half the possible citation orders, since three factors can be arranged in $1 \times 2 \times 3$ different ways. But the need for economy would usually lead to the use of only three permutations out of the six possible—those got by cyclic order (*cf.* 8.4).

The net result of using multiple entry (*see* section 8) in this way is that several different classifications are really being used at the same time. For one classification can be based on only one facet formula or citation order, e.g. Linguistics ÷ Language ÷ Problem, rather than Linguistics ÷ Problem ÷ Language, whereas multiple entry allows more than one facet formula (*viz.* Linguistics ÷ Language ÷ Problem and Linguistics ÷ Problem ÷ Language).

3.41 There are limits, clearly, to the degree to which entries can be multiplied if a file is not to become impossibly large. For example, a subject may have six or seven factors, as in "The use of Compressed Air in the Lubrication of Journal Bearings in Gas Turbines". Several points should be noted here:

- (1) Not all these factors will need a separate file to be maintained under them. Nobody is likely to ask for everything on 'Air'.
- (2) Where the documents themselves are kept in UDC order, one citation order must be regarded as the most helpful one and must be used for this purpose.
- (3) The impossibility of making *all* the possible permutations means that the problem of distinguishing between more and less helpful orders is still relevant.
- (4) One citation order must be decided on first, if only to give the main entry from which permutations are then made.

3.42 For these reasons the classifier must in practice have a clear idea as to which citation order would be best if the single classification, single entry method were followed.

There are, in fact, a number of general principles which have been advanced in order to assist classifiers to determine a citation order of elements in a compound subject. 'Simple' subjects, of course, present no problem, e.g. a treatise on Chemistry, or Metallurgy. But any 'compound', e.g. Tempering of steel, immediately raises the problem of citation order. These general principles will be considered later [see 4.2 and 4.3].

3.5 NOTATION AND ITS FUNCTIONS

The function of the notation (the code system of numbers and other symbols representing the terms of the classification) must be clearly understood. It is *to maintain the order* decided on for the classes. For example, labelling the class Economic organization of the coal industry 338:622.33 allows it to be located in a mechanical fashion without reference to the rest of the classification. Without such a label, it could only be located by knowing the whole pattern of the classification—e.g. that coal mining 622.33 is a part of mining 622, which is a part of engineering 62, which is a part of the class technology 6, and that this has been subordinated to the economics of industry 338, which is part of economics 33, which is a social science 3. And this is not all. One would need to know whereabouts in the sequence of main classes Social science was, whereabouts the subclass Economics was in the sequence of particular social sciences, and so on.

In UDC the notation often performs a second useful function in reflecting the relation between classes in the numbers by which it represents them. For example, that mining is a subclass of engineering is suggested by their respective class numbers 622 and 62, the first being a decimal fraction of the second. Sometimes the exact relation is symbolized, e.g. 338(410) for Industry (Great Britain) shows not only that 338(410) is a division of 338 but that it is a division based on a spatial relation, since (1/9) in UDC always means a place.

But this 'expressiveness' in notation is by no means a constant feature and frequently the class numbers for two related topics fail to reflect the relationship. For example, 574 is Biology and 59 is Zoology; the fact that Zoology is a division of Biology is not at all apparent from the notation. Similarly, 629.135 is Heavier-than-air aircraft but its subclasses are numbered 629.136, 629.137, etc., not 629.135.1, 629.135.2, etc.

Thus, notation is entirely subsidiary to the order of classes; it is its servant. This point is laboured here because preoccupation with the numbers as such can be fatal to consistent and effective classification. It may be noted here that 'decimal classification' refers only to the notation in UDC; knowledge itself does not regularly break up into tens or any other number.

4. PRACTICAL CLASSIFICATION—SUBJECTS, FACETS, CITATION ORDER

4.1 ORDER

The first point—and one which is fundamental—is that to classify is to decide the *relative position* of the subject in the hierarchy of classes that constitutes the classification system, e.g. to decide whether vacuum distillation of ethyl alcohol goes under the operation (vacuum distillation) or the substance (ethyl alcohol). How this relative position is to be secured—that is to say, what class number it will have to represent it—is quite secondary. Thinking should always be in terms of the order or grouping required, not in terms of notation.

4.2 THE NATURE OF SUBJECTS—FACETS AND SUB-FACETS

4.21 The subject matter of nearly all documents is complex in nature; it is a composite of several elements or factors. For example, the subject "Influence of Fertilizers on the Vitamin B content of Wheat" reflects a relation between Food chemistry and the agricultural problem of using Fertilizers in Wheat production. Within a relatively narrow field, this complex nature persists. "Investigation of fractured steel plates from welded ships" reflects relations between a whole thing (ship), a kind of ship, based on method of construction (welded), a material (steel), a form (plate) and a process (fracturing).

4.22 Since the UDC is a general scheme, it is convenient to draw a rough distinction between two types of subject, though no theoretical importance is attached to this—it is purely a matter of convenience in describing practical work.

A **compound subject** is one which reflects more than one facet within a conventional class: for instance, within the class Chemistry, a subclass reflecting both a substance and an operation (e.g. Vacuum distillation of Ethyl alcohol) is a compound; or, within the class Building, Concrete Roof is a compound, reflecting both a material and a part.

A **complex subject** is one which reflects more than one distinct conventional class, e.g. Psychology of Teaching, or influence of Cosmic rays on Sugar content of Beet, or Linguistic analysis and Information retrieval.

4.23 The important technical term 'facet' should be clearly understood. A facet is the total of subclasses produced when a class is divided by one principle of division (see 3.1). For example, if architecture is divided by kind of building to give residence, factory, church, etc., these will all be part of the 'buildings' facet of architecture. Again, to divide aeronautics by kind of aircraft gives such subclasses as military, civil, passenger, freight, landplane and seaplane, and the total subclasses thus produced will make up the 'aircraft' facet of aeronautics, as distinct from, say, the 'part of aircraft' facet (e.g. landing gear, wings, control surfaces).

4.231 It is readily apparent that within a facet can be distinguished 'subfacets'. For example, kinds of aircraft may be designated by 'thing transported' (passenger, freight), by 'base of operations' (land, sea), by 'method of propulsion' (jet, turbo-prop) and so on.

4.24 The classifier should not be worried by the complexity of these distinctions. They can be handled with reasonable satisfaction if the principles described below are observed. At this point he will be warned simply that he should attempt to be aware all the time of this underlying structure. For example, when classifying a document on effects of Ensilage with Ammonium nitrate on the value of Sugar beet Tops as Fertilizers, he should realize that what he is deciding is the relative significance of different facets of the subject of agriculture—processes (e.g. storage) and kinds of these processes (e.g. ensilage), agents in storage (e.g. ammonium nitrate), kinds of crop by function (e.g. fertilizers), kinds of crop by structure (e.g. sugar beet) and parts of a crop (tops), i.e. the crop here is the sugar beet *top*, not the sugar.

4.3 CITATION ORDER OR FACET FORMULA

To decide the position of a subject in a classification is essentially to decide the citation order of elements in it. For example, in a file on building and architecture, a document on Sound insulation of Party walls for Houses could be classified under Houses—Party walls—Sound insulation, or Party walls—Sound insulation—Houses, or Sound insulation—Party walls—Houses (and three other orders are possible).

Which of these is chosen depends entirely on which is regarded as the most helpful order for the documents. The first one, for example, implies an order in which everything on the Kind of building (here, Houses) is kept together, everything on the Part of

a building (here, Walls) is subordinated to the kind of building in question (if a particular kind is mentioned—it may not be, of course) and everything on an installation (like Sound insulation) will be subordinated to the kind of building (if one is mentioned) or to a part (if one is mentioned), or to both together.

4.31 Users' interests. Citation order should reflect the interests of the users. If the document above is thought of primarily as a contribution to Sound insulation, then the third order should be adopted; for entries on those elements of a topic which are cited second, third, etc., are obviously scattered. If the first citation order were followed, material on an installation, like sound insulation, might be found under various Kinds of Building, under various Parts (e.g. sound insulation of Floors), or under different parts of different buildings (as in the example above).

The seriousness of this need not be exaggerated. Such scattering is only serious if everything on a particular 'distributed relative' (cf. 3.2), such as Sound insulation in the last example, is requested. If a request is simply for Sound insulation of houses, say, reference to the A/Z index (cf. 2.2) will quickly locate it.

4.32 Consistency. Since the major object of organizing the documents is to permit quick retrieval of any particular item or class of items without fear of overlooking it, absolute consistency is essential. It would be a poor file which sometimes subordinated sound insulation to the kind of building and sometimes did the reverse. In more general terms, it could be said that in this hypothetical file an installation should always be subordinated to a part, say, and never vice versa.

4.33 Helpful order. It can be seen from the above, then, that practical classification is really the problem of deciding a 'facet formula' within each class—i.e. of deciding a definite citation order of the elements in the subject—and following this strictly when classifying documents in that class; also, that this formula should be based on the needs of the users. In this way, the classifier will organize the file in the most helpful order and at the same time his work will be consistent and predictable. For example, in a file on Library science, one might follow a strict formula, thus:

Library science ÷ Library service ÷ Library material ÷ Problem or activity ÷ Place ÷ Time. If so, a compound such as "Cataloguing of Manuscripts in Mediaeval Monastic libraries", would automatically be classified as:

Monastic libraries—MSS.—Cataloguing—Mediaeval.

4.4 DECIDING A CITATION ORDER (cf. 5.5 and 8.4)

Although it was stated above (4.33) that this should be based on the needs of the library or information centre, this injunction alone is inadequate as a guide. For although it may be reasonably clear which element is to be cited first in a topic—and which, perhaps, second and third, the number to be taken into account will often exceed this.

Moreover, some collections classified by UDC are fairly broad in scope, and more precise guidance is needed if the location of complicated subjects is to be rapidly and consistently decided.

What follows is a brief account of a number of such general principles. They are valid for classification (i.e. 'placing' a document) by any scheme, but their particular relevance to UDC users will be indicated. The method of one entry per topic, with 'distributed relatives' being indicated by a detailed A/Z index, is assumed for the reasons given in 3.41 (*but cf.* 8.4).

4.41 Subject factors precede all others. 'Others' here mainly relate to forms of presentation of the information in the document, e.g. a "Dictionary of organic chemistry" is Chemistry—organic—dictionaries, since a dictionary is simply a way of arranging and presenting the information. Similarly, "Specifications for wood sash

windows" is Windows—Wood—Sash—Specifications; or a German work on "Fatigue tests for aluminium alloys" is Aluminium—alloys—fatigue—testing—in German (if it is thought necessary to indicate language at all).

If for any reason one wishes to keep any of these forms together (e.g. all dictionaries), this should be a conscious decision, not the result of a failure to recognize that this factor (dictionary form) has nothing to do with the information content.

4.42 'Consensus'. If a subject is traditionally studied along certain lines so that there is a strong expectation on the part of users to find certain aspects of the subject kept together, then this may determine citation order. For example, study of linguistics is largely conducted within a given language rather than a given linguistic problem. So English prepositions would be Linguistics—English—prepositions.

This principle may be of only limited helpfulness in a special library (*but see* 5.442).

4.43 Decreasing concreteness. This is a principle used in a simple way by Kaiser (*Systematic Indexing*, London, 1911) and developed considerably by Ranganathan in his *Colon classification* (6th ed., 1961). More concrete elements are always cited before less concrete ones. The processes and properties of, and the operations performed on, 'concrete' things are subordinated to those things. For example, Medicine—lungs—diseases; Medicine—lungs—physiology; Agriculture—sugar beet—storage—ensilage.

The drawback to this principle is the lack of precision in the concept of 'concreteness' in many fields; for instance, in the Colon classification, although space and time are normally regarded as the least concrete of five 'fundamental categories', in the field of architecture, as in all the fine arts, they are regarded as determinants of the style, and this latter is the most 'concrete' category in that field. So the Georgian house is cited as

Architecture—Great Britain—1720/1840—houses.

4.44 'Purpose'. Basically, this is the principle of subordinating means to ends. Most subject fields reflect activities of some kind, the purpose of which is, ultimately, the production of something. This is particularly true of technology. For example, in agriculture, the end product is some plant or animal Product and operations like selection or storage are means to that end; so the citation order is Product—Operation. In paper manufacture, the end-product is the kind of paper according to function (e.g. writing paper, tissue paper) and this would precede in citation order kinds of paper according to pulp material (e.g. rag, straw) and the various operations, machines, etc., used in its production. In a 'service' industry, the service itself is the end product: for instance, in transport, this is the 'Thing carried' (the object of transport being to convey things) and this would be cited before the Medium of transport, the transport Problem (e.g. safety, timetable compilation), etc.

4.45 'Dependence'

This is closely related to the concept of 'Purpose' (4.44). According to this principle, if in a compound subject an element y is dependent on, or implies, another element x, then y is subordinated to x, and the citation order is xy, not yx.

Thus, a Part depends on the Whole (giving a citation order Whole—Part) as, for example, when a study of the (human) nervous system is put under Medicine, which is to observe implicitly a citation order [Biology, humans]—Nervous system. Similarly, Properties reside in a thing (giving an order Whole—Property, or Whole—Part—Property. Processes are activities which go on in a thing (giving an order Whole—Process, or Whole—Part—Process): Operations are activities conducted or directed by human beings on things (giving an order Whole—Operation, or Whole—Part—Operation, or Whole—Part—Process—Operation); Agents or Tools used in a process

or operation are obviously determined by these (giving an order Process—Agent, or Operation—Agent). B. C. Vickery has described most of these relations in some detail in his *Classification and indexing in science*, Butterworth, 1959, (pp. 31–36).

4.46 Standard facet formula for citation order

There is no suggestion, of course, that one document will ever reflect all these elements in its subject matter. They will rarely, if ever, appear all together at the same time. But in the classification and indexing of science and technology, some of them will appear in nearly all documents.

The following formula indicates an order of citation which is not merely a logical one but one which, if applied consistently to the classification of a collection, will generally produce a helpful order; it may well be followed whenever the particular needs of the collection do not strongly indicate a different one:

**Whole thing—Kinds—Parts—Materials—Properties—
Processes—Operations—Agents.**

4.461 It should be noted that any one element in a compound subject may be divided itself into Kinds, Parts, etc., so that a Part (e.g. window) will have its Kinds (e.g. sash window) and its own Parts (e.g. frame, catch); a Material will have its Kinds (e.g. softwood) and Parts (e.g. shavings), a Property (e.g. Variation) its Kinds (e.g. periodic, continuous), a Process (e.g. reproduction) its Kinds (e.g. sexual, vegetative), and so on.

4.462 When this occurs, as for example in the subject Houses—windows—sash, it looks as though the standard citation order is being ignored, since a Part is followed by a Kind (in the sequence Whole thing—Part—Kind). But this is not so, since the Kind refers to Kind of the immediately preceding element (i.e. Kinds of window), not to the primary element (Houses).

4.463 Similarly, a Process or Operation may be divided into its Kinds to give, say, Welding—Gas welding—Oxyacetylene, reflecting a citation order Operation—Kind—Kind. But here again, the Kind refers to the Operation, not to any preceding element (e.g. Pipes—Welding—Gas welding—Oxyacetylene).

4.464 Common sense (reflecting, usually, the notion of 'Dependence'—see 4.5) will make it clear where this apparent breaking of the citation order must be followed. But when a given element is thus qualified by Kind, Part, etc., before the next main element in the standard citation order is given, the same relative order will be observed as in the standard citation order. For instance, in House—Window—Sash—Catch—Design (Whole—Part—Kind—Part—Operation), the insertion of Kind and Part after Window observes basic citation order.

4.47 Examples of application of the standard formula for citation order

4.471 Dust—Quartz—Determination—X-ray diffraction—Counters—Geiger counters

Here (in a Safety in Mines Research Establishment report), the Quartz is a Kind of dust, Determination is an Operation performed on it, X-ray diffraction is a method used in that operation (an Agent), Counter is a piece of equipment (a special Kind of agent) and Geiger counter is a Kind of counter.

4.472 Effects of ensilage with ammonium nitrate on the value of sugar beet tops as fertilizer

This would be classified as: Fertilizer crops (Whole thing, reflecting the end-product)—Sugar-beet (Kind of crop)—Tops (Part of crop)—Ensilage (Operation)—Ammonium nitrate (Agent).

4.473 Use of plastic film liners for fruit pulp barrels would be classified as:

Fruit (Whole thing)—Pulp (Kind, according to state or condition)—Storage (Operation)—Barrels (Agent)—Liners (Part of agent)—Plastic (Material of part of agent).

4.474 Timber manufacture—Woodworking—Assembling—Gluing—Heating—Radio-frequency heating

Here, Woodworking is an Operation (in the manufacturing of the 'Thing' timber), Assembling is a Secondary Operation, Gluing a Tertiary Operation which implies an Agent (glue) on which the Operation 'heating' is performed, and Radiofrequency heating is a Kind of heating (designated by Agent used).

The commonsense nature of the notion of 'Dependence' is brought out clearly by this sequence of elements in an operation.

4.475 Petroleum—Refining—Equipment—Heat exchangers—Tubes—Copper—Alloys—Specifications. Refining is an Operation performed on the 'Thing' petroleum, Equipment is an Agent in the operation, Heat exchangers are a Kind of equipment, Tubes a Part of this kind, Copper the Material constituting the part, Alloys a Kind of this material, and Specifications the Form of Presentation of the information.

4.476 Medicine—Circulatory system—Blood—Physiology—Coagulation, the first term implies a Whole thing (man), the second a Part, the third a Part of that part, the fourth a Process (physiology) and the fifth a Kind of process.

4.48 Influence, tool and bias phase

A few recurrent situations in practical classification are usually handled by some fairly well established rules, which are all consistent with the notions of 'Purpose' and 'Dependence' (4.44 and 4.45).

4.481 Influence phase

If one thing influences another, classify under the thing influenced, e.g. "Influence of climate on man" goes in Anthropology, not Climatology. This is analogous to the subordination of Agent to Thing or Process. The technical term for it is 'Influence phase'.

4.482 Tool phase

If one discipline is used to assist the investigation of another, classify under the thing investigated, not under the tool of investigation, e.g. "Intelligence tests in grammar school selection" goes under Grammar school selection, not Psychology (intelligence tests). This too is analogous to the subordination of Agent to Thing or Process. The technical term is 'Tool phase'.

Closely related is the situation *when one subject is expounded through another*, e.g. "The mechanism of economic systems: an approach to the problem of economic stabilization from the point of view of control-system engineering", which would be classified as: Economics—stabilization—*expounded through* control-system engineering.

4.483 Bias phase

If one topic is described (usually in a relatively elementary manner) for the benefit of workers in another subject, classify under the topic introduced, not the persons for whom it is written, e.g.

"Women's measurements and sizes", sponsored by the Joint Clothing Council, Ltd., is an anthropometric study and, although produced for manufacturers of clothing, contains information on human measurements, i.e. physical anthropology, under which it is classified (in a general collection). Similarly, "Psychology for nurses" goes under Psychology, not Nursing.

The technical term for this is 'Bias phase' and there may be occasional difficulty in distinguishing it from Tool phase (4.482), though usually the situations are quite distinct.