CLASSIFICATION, CODING, AND MACHINERY FOR SEARCH

by


President, Indian Library Association

Professor of Library Science, University of Delhi

April 1950
# CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conspectus</td>
<td>3</td>
</tr>
<tr>
<td>Preliminaries and Terminology</td>
<td>5</td>
</tr>
<tr>
<td>001 Enumerative Classification</td>
<td>5</td>
</tr>
<tr>
<td>002 Hybrid of Enumerative and Analytico-Synthetic Classification</td>
<td>6</td>
</tr>
<tr>
<td>003 Analytico-Synthetic Classification</td>
<td>6</td>
</tr>
<tr>
<td>006 Terminology</td>
<td>7</td>
</tr>
<tr>
<td>007 Concepts</td>
<td>7</td>
</tr>
<tr>
<td>01 Main class</td>
<td>7</td>
</tr>
<tr>
<td>012 Lower Limit</td>
<td>8</td>
</tr>
<tr>
<td>013 Upper Limit</td>
<td>10</td>
</tr>
<tr>
<td>014 Hospitality in Array</td>
<td>11</td>
</tr>
<tr>
<td>015 General and Special Collections</td>
<td>11</td>
</tr>
<tr>
<td>016 Centralization of Documentation</td>
<td>12</td>
</tr>
<tr>
<td>017 Field of knowledge, Infinite</td>
<td>12</td>
</tr>
<tr>
<td>018 Needs of local service</td>
<td>12</td>
</tr>
<tr>
<td>02 Facet Analysis and Principal Focus</td>
<td>13</td>
</tr>
<tr>
<td>03 Specific Subject and Focus</td>
<td>15</td>
</tr>
<tr>
<td>04 Compound Primary Focus</td>
<td>17</td>
</tr>
<tr>
<td>05 Phase Analysis</td>
<td>17</td>
</tr>
<tr>
<td>06 Qualities of a Classificatory Language</td>
<td>19</td>
</tr>
<tr>
<td>07 Mode of Self-Perpetuation</td>
<td>22</td>
</tr>
<tr>
<td>08 Act of Classifying</td>
<td>24</td>
</tr>
<tr>
<td>1 The Services of Classification</td>
<td>26</td>
</tr>
<tr>
<td>0 Evolution Classification</td>
<td>26</td>
</tr>
<tr>
<td>10 Primary Service</td>
<td>27</td>
</tr>
<tr>
<td>12 Secondary Service</td>
<td>28</td>
</tr>
<tr>
<td>13 Tertiary Service</td>
<td>29</td>
</tr>
<tr>
<td>14 Quaternary Service</td>
<td>30</td>
</tr>
<tr>
<td>2 Classification as Aid for Search</td>
<td>31</td>
</tr>
<tr>
<td>21 Effect of being a Cipher</td>
<td>31</td>
</tr>
<tr>
<td>22 Effect of being Non-Cummutative</td>
<td>32</td>
</tr>
<tr>
<td>23 Aid of the Catalogue</td>
<td>32</td>
</tr>
<tr>
<td>24 Difficulties in Documentation</td>
<td>34</td>
</tr>
<tr>
<td>Chapter</td>
<td>Title</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>3</td>
<td>Chain Procedure</td>
</tr>
<tr>
<td>4</td>
<td>Coding</td>
</tr>
<tr>
<td>41</td>
<td>The Issues</td>
</tr>
<tr>
<td>5</td>
<td>Discussion of the Issues</td>
</tr>
<tr>
<td>51</td>
<td>Consumers' Issues</td>
</tr>
<tr>
<td>52</td>
<td>Producers' Issues</td>
</tr>
<tr>
<td>53</td>
<td>Final Decision</td>
</tr>
<tr>
<td>54</td>
<td>Present State of Work</td>
</tr>
<tr>
<td>6</td>
<td>Conclusion</td>
</tr>
</tbody>
</table>
Documentation service is the exhaustive and expeditious supply of all recorded materials on even microscopic units of thought embodied in articles in periodicals, parts of books, files of papers, etc. As a means to this, entries of them should be made, say, on punched cards or microfilm or magnetized tape, etc., indicating all the atomized constituent units of thought involved, so as to admit of rapid search by machinery. As a preliminary step towards this, the names of the microscopic units of thought indicated by each entry have to be coded, i.e. expressed in terms of written symbols. To make the translation from natural language to the written symbols and vice versa easy, whatever be the number of units of thought, however minute, however much they may be unknown and unknowable now and whatever be the time in which they may be isolated and written upon, it is comfortable if the translation is made in a canalized manner with the aid of what have been called phase analysis, facet analysis and sharpening of foci.

A system of organic, expressive symbols which is best suited for this is believed to be provided by a classification system of an analytico-synthetic kind - which amounts virtually to an artificial language of ordinal numbers, such as those used for arranging the recorded materials themselves in a helpful filiatory order.

The purpose of this paper is to describe the possible attributes of such a classification system developed by the library profession, to enable the engineering profession, which designs the machinery, to see why the service of machinery is sought and why the library profession would prefer such a classificatory ordinal language for coding.

Chapter 0 is on Preliminaries and Terminology and states the concepts involved in an analytico-synthetic classification system capable of individualizing even microscopic units of thought. It also indicates the essential qualities of such a classification - particularly the admission of neither homonyms nor synonyms. It envisages the designing of a self-perpetuating scheme of classification with a very long expectation of life.

Chapter 1 traces the evolution of classification under the pressure of the ever-increasing number of microscopic units of thought to be individualized and arranged and shows the secondary purposes which a classification can serve in addition to the primary one of arrangement.

Chapter 2 examines the limitations of classification as an aid for search as a result of its being a cipher and its symbols being non-commutative, and shows how the catalogue can remove these limitations when the materials listed are books embodying macroscopic units of thought. It also shows how such an aid is nullified when the materials embody microscopic units of thought.
Chapter 3 describes the chain procedure by which the classified part and the alphabetical part of the classification system can be linked so as to fit the classification-cum-catalogue to be an aid for search. It also shows how centralization of the preparation of documentation lists can lead to considerable economy. It further states that even greater economy can be had if the search can be by machinery interlocked with the machinery for copying the entries searched or teletyping them.

Chapter 4 defines coding and frames the issues on it to be answered best respectively by the library profession which has to serve the reading materials and the engineering profession which has to design the searching machinery.

Chapter 5 discusses the issues to be answered by the library profession and votes in favour of using in coding, the analytico-synthetic system of classification which the library profession has to use for arranging. It recommends soliciting the engineering profession to answer the other issues. It concludes with the factors which arise in the organization needed for the maintenance of the classificatory system in step with the new formations continuously being thrown forth in the field of knowledge and points out the need for research in the designing of a self-perpetuating scheme of classification and for continuous vigilance and research in classificatory technique.
CLASSIFICATION, CODING, AND MACHINERY FOR SEARCH

Chapter 0

PRELIMINARIES AND TERMINOLOGY

It is desirable to draw, as a preliminary measure, the line of demarcation between classification and coding (see definition in Section 4) to examine how far they are dependent on each other, and to determine what situations are better met by classification, which by machinery and which jointly by both. Both are aids in the exact, exhaustive and expeditious search of a mass of reading and kindred materials - embodying thought of all magnitudes, both macroscopic thought such as embodied in books and microscopic thought such as those embodied in articles in periodicals, and parts of books. The increase in the size of the collection and the decrease in the magnitude of the quantum of thought have been responsible to make us have recourse to machinery as an aid for search.

001 Enumerative Classification

Of these, it was the first factor which was felt first. The first aid devised to face it was Library Classification, which consists of representing units of thought or specific subjects by a system of ordinal numbers. Each number in this system is called a Class Number. A system of Class Numbers virtually constitutes an artificial language of ordinal numbers. It is a Classificatory Language. (Note: This generalized use of the term 'language' has the sanction of the New English Dictionary, Webster's International Dictionary and recent usage in the discipline of classification).

So long as the quantum of thought was macroscopic and got embodied in books, the class number of the specific subject embodied brought together all the books embodying it. Further, the location of the group of such books among the others was traced out rapidly by the ordinal value of the class number. Here the favourable factor was that each embodiment of the specific subject was a physically separate book.

Some sort of classification is resorted to even when the number of books is only a thousand, say. But a carefully designed classification system is needed when the number of books reaches a few thousands. The need for this is re-enforced when the number of persons seeking their respective books increases to such an extent as to include the lower quartiles (as determined by their mental alertness and capacity) of a community. These two causes began to take effect permanently and with increasing intensity about the middle of the nineteenth century. This social factor led to the emergence of the D.C. (Decimal Classification) about that time.

The ordinal notational matrix of the D.C. was sufficiently elastic for use even when the quantum of thought embodied in books began to shrink gradually.
But when the shrinkage went beyond a certain limit, the D.C. was found to be too rigid to meet the situation. This was beginning to be felt about a few years ago.

Hybrid of Enumerative and Analytico-Synthetic Classification

But even on the eve of the twentieth century, the number of periodicals had reached a high level and the number of articles embodied in them reached several hundreds of thousands. It was obvious that they would all run to waste unless the quantum of thought used as the basis for classification was reduced to their magnitude. To classify them by the D.C. was proving to be impossible. The result was the retention of the D.C. as the core and the embellishment of it with certain other features. The result was the U.D.C. (Universal Decimal Classification). The chief difference between the D.C. and the U. D. C. is that the former is essentially enumerative, while the latter added a dash of analysis-cum-synthesis onto this enumerative D.C. core. The introduction of synthesis suggested the analogy of a natural language. For, all developed natural languages have long ago ceased to be enumerative and become synthetic. After the First World War, the number of communities which began to pour out new thought and float new periodicals as their vehicles began to increase. Even in the already developed countries, the organization of industries stimulated more people to feed on recorded thought and to create new thought. One of the manifestations of this social phenomenon has been the emergence of the idea of the so-called "Special Libraries" and the emergence of the term "Documentation" which, in its essence, emphasizes the microscopic nature of the thought-units to be used as quanta in classification and service.

Analytico-Synthetic Classification

The shrinkage of the quantum of thought emphasized the unsuitability of an enumerative classification like the D.C. The hybrid of enumeration and analysis-cum-synthesis, which the U. D. C. is, is also sensed to be inadequate. The concept of synthesis suggested the possibility of looking upon a system of class numbers as an artificial language designed to aid and maintain arrangement in a mechanical manner. With this as the starting point, the C.C. (Colon Classification) began to take shape about 1925. During the last ten years, the C.C. is being studied and reconditioned consciously as an artificial language of ordinal numbers. It is felt that with suitable improvement such an analytico-synthetic classification can handle with comfort all problems of search if the total number of materials - entries really - involved does not exceed, say, a million.

When the entries exceed a million, the need for the use of machinery is felt.

The engineer can design the machinery better if he fully understands the purpose of the machinery, how best it can be linked to the classification system in vogue in documentation work.
Before proceeding further, therefore, it will lead to ultimate economy in thinking and discussion if we agree upon the terminology to be used to denote recurring concepts.

It will be a convenience to use the same terminology to denote a concept in whatever language it may be expressed - a natural or a classificatory one - or even the code patterns read by the machinery. If we can secure such an ubiquitous terminology, whatever complex idea is expressed in terms of such a terminology, it will with equal facility bring up to our mind its representation in words, or class numbers or code patterns. This by itself would mean considerable economy.

In the ostensible process of setting up the terminology, the concepts, which it is intended to denote and which lie equally behind classification and search by machinery will be examined. These may be of help in breaking down into ultimates the questions put to the selecting machine.

Incidentally, this conceptual exploration and terminology-fixing will throw forth some of the vital needs of an ever-growing field of knowledge which should be borne in mind not only by the classificationists who design classification schemes but also by the engineers who design machines for search.

The field of knowledge is, in the first instance, divided into a set of mutually exclusive, totally exhaustive, fairly homogeneous regions. These are largely, though not solely, conventional. These are the Main Classes, for example, in the C.C.

<table>
<thead>
<tr>
<th>Classificatory Language</th>
<th>Natural Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Mathematics</td>
</tr>
<tr>
<td>C</td>
<td>Physics</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>N</td>
<td>Fine Arts</td>
</tr>
<tr>
<td>O</td>
<td>Literature</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Y</td>
<td>Sociology</td>
</tr>
<tr>
<td>Z</td>
<td>Law</td>
</tr>
</tbody>
</table>

For classification purposes, the main classes must be enumerated in a helpful order and the notation of ordinal numbers should be so devised that the maintenance of this order is rendered mechanical, i.e. without the need of thinking out de novo the filiation among the main classes concerned.
If the number of main classes is $n$, $n!$ arrangements are possible. Most of these will be definitely unhelpful. But quite an appreciable number will be equally helpful. There has to be a forced preference from among them. But if the classificationist has preferred one such, it is futile to waste time in putting up an alternative arrangement.

**011 Generalia Main Class**

As reading materials exist expounding on an independent, co-ordinate basis two or more main classes; Generalia Main Classes of different degrees of extension - that is comprehending varying numbers of often related or even unrelated main classes - will have to be introduced at various points of the Array of Main Classes, in the degree of filiation to the succeeding main classes.

**Example**

<table>
<thead>
<tr>
<th>Classificatory Language</th>
<th>Natural Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>$A$</td>
<td>Sciences</td>
</tr>
<tr>
<td>$\Gamma$</td>
<td>Physical Sciences</td>
</tr>
<tr>
<td>$G$</td>
<td>Biological Sciences</td>
</tr>
<tr>
<td>$\Psi$</td>
<td>Humanities</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>Social Sciences</td>
</tr>
</tbody>
</table>

**0111** The ordinal values of the Greek letters are defined by the respective statements:

$B < \Gamma < C; \quad M < \Psi < N; \quad S < \sigma < T.$

**0112** At the very beginning of the Array of Main Classes is introduced the all-comprehensive Generalia Main Class, which should take for example (1) a universal bibliography or (2) a general encyclopaedia or (3) abstracts of all kinds of theses such as those published by universities.

**0113** For convenience of reference and for formal notational purposes, generalia classes of all degrees of extension are also spoken of as main classes, though they are of greater extension. If the distinction needs emphasis in any context, these may be referred to as Generalia Main Classes, and in contradiction the co-ordinate main classes enumerated in 01 may be referred to as True Main Classes.

**012 Lower Limit**

The number of main classes recognized has been gradually increasing. In the ancient times when dichotomy ruled, the number was two. For example, in some cultures these were:
(1) Other-worldly or Divine; and
(2) This-worldly or Mundane.

At a later stage the number of main classes increased to three. For example, in some schools of classification, these were:

(1) Philosophy;
(2) Literature; and
(3) History.

0121 The D.C. recognized 10; and the Expansive and certain other schemes, 26, the number being determined to some extent by the number of distinct symbols in the species of symbols chosen to denote the main classes - the Arabic numerals in the former and the Roman alphabet in the latter.

This happened in classificatory schemes designed before the concept established itself at the conscious level that a classification scheme is a language of ordinal numbers, that an ordinal number need not have correlated cardinal numbers and that a classificationist has the freedom to introduce extra symbols provided he defines their ordinal values precisely as has been shown in 0111.

0122 In the C.C., which throws all its primary symbols into a single, definite ordinal sequence whatever be their species, the number of main classes is determined more by the needs of the state of cultivation of the field of knowledge than by the numbers of symbols found in the species of symbols chosen for use. Indeed, it has been gradually changing the number of its main classes. It had 27 main classes in edn. 1 (1933) and 28 " " in edn. 2 (1939) and in edn. 3 (1950). It is proposed to have 33 main classes in edn. 4 (under preparation).

This has been suggested by the notational needs of the present state of specialization of knowledge.

0123 This tendency to increase the number of main classes as the intensiveness of the cultivation of field of knowledge increases is traceable to several needs which arise.

01231 There is the need for maintenance of the homogeneity of each main class

Examples

(1) In recent years it has been found convenient to separate Psychology from Philosophy and give it autonomy.
(2) The need is felt for Animal Husbandry, which was in the old convention shared by Medicine and Agriculture, to be given co-ordinate and independent status with those subjects and to be treated as a main class.

01232 Need may arise to provide additional generalia main classes of different degrees of partial comprehension of true main classes.

Examples

(1) In the C. C., it is found necessary and it is proposed to introduce the generalia main class Humanities, apart from Social Sciences which exists already.

(2) So also it is proposed to introduce the generalia main class Physical Sciences apart from Science (General) and Biological Sciences which exist already.

01233 Need arises to accommodate newly formed disciplines which do not belong to any of the existing ones and cannot be expressed in terms of any combination of the existing ones.

Examples

(1) In 1939 the need was felt to introduce a new true main class called Mysticism and Spiritual Experience. The need is discussed in detail in the "Memoirs" of the Madras Library Association for 1939.

(2) Need has arisen to introduce a new true main class to hold materials of the kind of Whitehead and Russell's "Principles of Mathematics" which now have a periodical of their own called "Symbolic Logic". It is still perhaps without a stabilized distinctive name in natural language. Inclusion of this in the main classes Mathematics or Philosophy (which includes Logic) destroys the homogeneity of either and wrongs the individuality of the new discipline itself.

0124 There is a general tendency for the lower limit of the number of main classes - including the true and the generalia ones taken together - to increase, though very slowly.

013 Upper Limit

It is conjectured that there exists an upper limit to the number of main classes into which the field of knowledge can be conveniently divided. It is feared that if the upper limit is crossed,

(1) the task of maintaining mutual exclusiveness among the main classes may prove hazardous;
(2) it would amount virtually to recognizing the subordinated sub-classes of a true main class as notationally and formally co-ordinate with it;

(3) the mind would not be able with comfort to comprehend, recognize and act upon the boundary lines between the main classes.

The tentacles interlacing the main classes will be too strong to be severed and comparable in dimensions to the main classes themselves, so that the passage from one main class to another will not be sharp enough to be realized. The boundaries will be as difficult to recognize as those of the metropolitan boroughs of London. To put it in other words, it will be like regarding the still undeveloped foetus living in the mother's womb with its circulatory system as an integral part of that of the mother, as organically distinct from the mother.

Perhaps it may be hazarded to place the upper limit to the number of main classes at 50 or 60.

The approach to the upper limit will be very slow and it may be many years before it will be reached.

014 Hospitality in the Array of Main Classes

The main factor which must be faced by classification and machinery for search alike is:

The number of main classes is not rigidly fixed forever.

The notational mechanism of classification and machinery for search should have inherent devices to satisfy the Canon of Hospitality in Array even in regard to the array of main classes, i.e. should be capable of accommodating new main classes in helpful filiatory positions among the already existing ones without disturbing their representation.

015 General and Special Collections

The above-mentioned desideratum is liable to be overlooked when experience is confined to special collections confined to a particular region of knowledge - as for example the library of a business house. It will also be so when one thinks of documentation service in a specific subject, if it be done on an international basis. Such an overlooking of the desideratum will stand in the way of subject bibliographies being integrated with general bibliographies. General libraries will then have to adopt a classificatory system different from all the different systems developed for the different specific subjects. Will there be also need for differences in the machinery for search? Perhaps not.
016 Centralization of Documentation

There is a noticeable realization that the world can ill afford to overlook economy of manpower, money and time, and in the library world that economy can be secured only if bibliography-building is done centrally on a national basis and, in certain specific subjects which are too deep and potent to have many readers, even on an international basis. The incidence of arbitrariness, which looks like convenience at the beginning, will prove inimical to centralization of classification.

If centralized agencies are set up for documentation, considerations of economy will further assert themselves and demand the setting up of an all-comprehensive or universal classification.

This appears to be already realized to some extent. Indeed classification has been seen in 001 to 003, as amounting to translating names of specific subjects into an organically developed, centrally controlled, artificial language of ordinal numbers. According to the latest school of thought - represented by the C.C., even the choice of the primary symbols (these correspond to phonemes in a natural language) has to have helpful purposiveness and possess deep mnemonic values. This amounts to saying that arbitrariness should be discountenanced ruthlessly.

017 Field of Knowledge Infinite

Classification emphasizes that the field of knowledge is infinite. What is known at any moment may be finite. What is yet to be known is always infinite. Transfers take place every moment from the unknown to the known. They have now begun to take place in a very crowded way. All new arrivals have to be accommodated among the old arrivals in a highly helpful, filiatory way and not at all in an arbitrary way. An ordinary human mind needs this. Classification, therefore, excludes arbitrariness in the building up of its language of numbers.

018 Needs of Local Service

Classification recognizes that Local Service in all the numerous centres has (1) to look upon the documentation produced in an impersonal way at national or international centres and distributed through national or international organs of documentation as half-cooked stuff which needs to be further cooked and properly dressed to suit the 'individuating particularities' of the needs and tastes of individual consumers; and (2) to do even the preliminary cooking, for a temporary period, of such of the nascent thought as is published in the periodicals and books taken in the local centre and is wanted by the local consumers until it is half-cooked by the central organization and re-distributed through the documentation media.
As stated in 016, the first of these is a paramount need; it is also a perennial need.

The second is also a paramount need as new thought has its greatest potency when it is nascent and much mischief will follow if it is not served before it becomes stale. It may not be perennial. But it will be necessary so long as the present time-lag between the release of nascent thought in periodicals and books and the release of the documentation medium featuring it continues.

The performance of these two pieces of work at the local level will need classification. Any element of arbitrariness in notation will make its classification deviate from that of the national or international centre and many difficulties will follow in its wake. An organic, deeply mnemonic classification alone will give the necessary autonomy to the local classifier and yet ensure that the class number which he assigns to nascent thought will have a high probability of being the same as the centre will give it or any other locality will give it.

The force of the above factors get increasingly intensified as we descend down the chain of sub-classes into greater depths. We shall develop the concepts and set up the terminology which will be of help to follow the phenomena which appear as we enter the deeper layers in the field of knowledge.

02 Facet Analysis and Primary Focus

Many of the true main classes admit of further sub-division on the basis of two or more trains of characteristics.

Example

Medicine (=4) can be sub-divided either on the basis of the organ studied, like digestive system, circulatory system, nervous system, etc., or the problem pursued like anatomy, physiology, disease, etc.

021 The totality of sub-classes based on a single train of characteristics of a main class constitute one of its facets. A facet carries the same name as the train of characteristics to which it is related.

Example

The statement in the example of 02 may be put as "Any specific subject of the main class Medicine may present two facets viz. Organ Facet and Problem Facet."

022 Each sub-class in a facet is a primary focus.
Example

The following are some of the primary foci of the main class Medicine:-

In the Organ Facet

<table>
<thead>
<tr>
<th>Classificatory Language</th>
<th>Natural Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Digestive system</td>
</tr>
<tr>
<td>3</td>
<td>Circulatory system</td>
</tr>
<tr>
<td>7</td>
<td>Nervous system</td>
</tr>
</tbody>
</table>

In the Problem Facet

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Anatomy</td>
</tr>
<tr>
<td>3</td>
<td>Physiology</td>
</tr>
<tr>
<td>4</td>
<td>Disease</td>
</tr>
</tbody>
</table>

0221 A set of co-ordinate sub-classes of a class is called an Array.

0222 The notation should provide for infinite hospitality in Array. In the C.C. the Octave Notation is used for this. The Hague Conference (1948) of the F.I.D. recommended the examination of its adoption by the U.D.C.

023 Each successive sub-division of a sub-class in a facet results in new sub-classes of higher order - i.e. of narrower extension and deeper intension.

Each succeeding focus is said to be sharper than the preceding one.

Example

In the Organ Facet

21 Mouth is sharper than 2 Digestive System
212 Cavity of Mouth " " " 212 Mouth
2125 Palate " " " 2125 Cavity of Mouth
21253 Soft Palate " " " 21253 Palate

and so on

In the Problem Facet

42 Infectious is sharper than 4 Disease
disease
421 Tuberculosis " " " 42 Infectious disease
024 A hierarchy of modulated foci of increasing sharpness is said to form a Chain of Classes. Each focus in a chain is called one of its links. As we go down the chain, the order of the links is said to increase.

It may sometimes be helpful to represent the hierarchy of classes in the form of a chain. Such a representation is prescribed in the Chain Procedure which gives a mechanical way of deriving the specific subject headings and see also subject headings or class index headings of a catalogue, from the class number of the specific subject.

\[2 = \text{Digestive System}\]
\[21 = \text{Mouth}\]
\[212 = \text{Cavity of Mouth}\]
\[2125 = \text{Palate}\]
\[21253 = \text{Soft Palate}\]

0241 The notational device should provide for infinite hospitality in Chain. In the C.C. as well as the U.D.C., the decimal fraction notation provides for this.

03 Specific Subject and Focus

A primary focus in isolation, i.e. not taken with its main class, cannot be a Specific Subject.

031 A specific subject may be the entire main class with no sharply defined focus in any of its facets i.e. with all its facets empty or diffuse. Such a specific subject is a broad focus.

**Example**

D Engineering  
K Zoology  
L Medicine  
O Literature  
S Psychology  
V History  
X Economics  

032 A specific subject may be a main class with a definite focus in one and only one of its facets. Such a specific subject is a simple focus.
Examples

L2  Digestive System
L21  Mouth
L3  Circulatory System
L35  Heart
L7  Nervous System
L71  Brain
L711  Meninges
L7113  Pia mater

are simple foci derived from the primary foci in the Organ Facet of Medicine.

L:4  Disease
L:45  Functional disorder
L:453  Complicated functioning
L:4537  Allergy

are simple foci derived from the primary foci of the Problem Facet of Medicine.

033  A specific subject may be a main class with a definite focus in two or more facets. Such a specific subject is a Compound Focus.

It may be taken as being derived by so laminating one facet over another that the focus in the one is superimposed over the one in the other and a focus sharper than either results. Viewed in this way, the resulting compound focus is also called a Laminated Focus.

Example

In the main class L Medicine, by compounding or laminating 2 (Digestive Systems) and 4 (Diseases), we get

L2:4  Disease of the Digestive System

as a Compound or Laminated Focus.

0331  A primary foci of any degree of sharpness can be laminated.

Example

2153  in Organ facet is Soft Palate
4725  in Problem facet is Cancer
therefore L2153:4725  is Cancer of the Soft Palate.
0332 A focus got by the lamination of two primary foci is a double-compound focus or a double-laminate.

Example

The same as those given in 033 and 0331.

0333 A focus got by the lamination of three primary foci is a treble-compound or a triple-laminate.

Example

L2153:4725:63129 Radium therapy of cancer of soft palate.

04 Compound Primary Focus

The ordinary method of sharpening a primary focus is to carry its sub-division to another stage on the basis of a characteristic appropriate to it at that stage. In the notational language this is reflected in the addition of another digit on the right.

Examples

Same as in 023.

041 Another method which is occasionally available and is appropriate to sharpen a primary focus is to laminate over it another primary focus taken from the same facet. In the notational language, the numbers denoting the two primary foci are connected by the conjunctive symbol "-" (hyphen). This is called a Compound Primary Focus. It is still primary since it belongs to a single facet and cannot denote a specific subject unless it is taken with the main class to which the facet belongs.

Example

In the organ facet of Medicine

25  Intestines
76  Motor nerves
25-76 Intestinal motor nerves

05 Phase Analysis

It often happens that a focus in one main class is brought into relation with a focus in another main class. The foci so brought into relation may be severally broad or simple or compound. Each of such foci is called a Phase. That which is the fundamental subject of exposition is called the Primary or the
First Phase and the other, which plays a subordinate part and merely determines the nature of the treatment given to the first, is called the Second or the Secondary Phase. A third, fourth, etc., phase also may be presented by some specific subjects.

**Examples**

1. Medicine for Lawyers where Medicine is the first phase and Law is the second phase.

2. Statistical study of the radium treatment of cancer of the soft palate where statistical study is the second phase and the other is the first phase.

3. Changes in muscle viscosity following disease,
   where,
   Muscle is the first phase;
   Viscosity is the second phase; and
   Disease is the third phase.

In the U. D. C., the conjunction which connects the phases is always "::" (colon) i.e. whatever be the nature of the relation between them, and the phases can be put in any order.

In the C. C., several kinds of relation are recognized and distinctive connective symbols are prescribed for them.

Some of the relations so far provided with their own connecting symbols are

(1) Bias relation
(2) Tool relation
(3) Aspect relation
(4) Influence relation
(5) Comparison relation
(6) Application relation

Further, the phases can follow one and only one order:

**Examples**

LOZ = Medicine for Lawyers
L2153:4725:63129:B28 = Statistical study of the radium treatment of the cancer of the soft palate
L83:C2:6306:4 = Changes in muscle viscosity following disease.
A focus formed by the assembling of two or more phases is a Complex Focus.

The components of a complex focus may themselves be severally broad or simple or compound foci.

To shorten the length of the notation of complex foci without any loss of precision, several prescriptions are possible. Some of them are already in use. More can be laid down.

Qualities of a Classificatory Language

A classificatory language should have the following essential qualities:

1. Each class number should have an unique and stable meaning.

2. It should admit of no homonyms or synonyms.

These are more fully enumerated in part 1 of the "Library Classification: Fundamentals and Procedure" (1944).

The canons which should be observed in classification have been expounded in the "Prolegomena to Library Classification (1937)".

The principles by which helpful order may be determined, in a consistent standard way, among specific subjects have been stated in the "Elements of Library Classification (1946)".

A desirable quality in a classificatory language is that it should be self-perpetuating in the sense that as new concepts get created, each can be translated into a unique class number of its own which would put it in a helpful filiatory place among those already existing. It must be possible for anybody to arrive at the same class number.

The expectation of life of a scheme of classification depends on the extent to which it has this quality. This is due to the field of knowledge being an ever-expanding, ever-changing, dynamic continuum.

A fuller discussion of this idea will be found in the "Journal of Documentation" 1949.

Imagine craftsmen who are building a settlement, with a chest of drawers full of instruments, only some of which are well arranged and the use of which is only partly known. Imagine that, from behind, new instruments are continually put into the drawers, that some instruments are modified by unknown people and that the craftsmen learn to use some of the old instruments in a way hitherto unknown. Now imagine further that the plans dealing with the building of the
settlement are changed too. That resembles to some extent the situation created in the field of knowledge and the reading and kindred materials for those engaged in designing and applying library classification.

064 - Mnemonics -

For self-perpetuation in regard to the primary foci in a facet of a main class, a system of Unscheduled Mnemonics is used in C.C. According to this, each arabic numeral is specialized to represent one or other of a set of related concepts. The exact concept it represents in a given class number is determined by the Gestalt of the class number. This is apart from scheduled mnemonics which are much easier to apply.

Example

3 may be Physiology, Functioning, Functions, Activities, and so on.

In L:3, it is Physiology where

L is Medicine

In P:3, it is Syntax where

P is Linguistics

In W:3, it is Functions where

W is Political Science

In Y:3, it is Social Practices where

Y is Sociology

In Z:3, where Z is Law, it is Contracts.

A fuller discussion will be found in the "Philosophy of Library Classification" (1950) and the "Colon Classification" Edn. 3. (1950)

065 Optional Facets and Fundamental Elements

For self-perpetuation in regard to facets, i.e. in regard to compound foci, a prolonged investigation has been in progress since 1949. The provisional findings are being published under the heading, "Optional Facets", in the "Abgila" (the Annals, Bulletin and Granthalaya of the Indian Library Association) to elicit suggestions before they are finalized.

0651 The proposal is that: 1. The Facet-Formula of each main or canonical subject should mention only a minimum number of Compulsory Facets; 2. The practice of indicating vacant facets by the insertion of the connecting ":" should be confined only to these Compulsory Facets; and 3. Provision should be made
for the interpolation or extrapolation of Optional Facets amidst and outside the compulsory facets in only those specific subjects which warrant them.

0652 All facets are regarded as manifestations of one or other of the five fundamental elements - Time, Space, Energy, Matter and Personality. These contain in latent or unmanifest form all the possible facets of all possible subjects. In different subjects they manifest themselves with different names and functions.

0653 Different connecting symbols are prescribed for the manifestations of the different fundamental elements as facets, except in the case of time and space where the difference in facet gets emphasized by other factors.

For Time . Full stop
" Space . Full stop
" Energy : Colon
" Matter ; Semi-colon
" Personality , Comma

The ordinal values of these connecting symbols are defined by the following sequence which is in ascending order:

0 . : ; , - 1
Zero Full stop Colon Semi-colon Comma Hyphen One

The design of these connecting symbols with the prescribed ordinal values ensures that the order of the facets is automatic and admits of no variation.

0654 This approach provides that if any new specific subject is created, presenting new facets, a classifier can recognize the respective fundamental elements of which they are manifestations, determine the respective primary foci in them and insert them in appropriate places among the foci of it, which belong to the facets already prescribed by the facet formula.

Whoever is the classifier, the same new facets will be recognized and assigned the same places.

0655 It is being attempted to devise what is known as Signature Digits to introduce several possible types of manifestations of each of the fundamental elements as master or primordial schedules which will give the numbers for the facets of several kinds in the various subjects. About 120 primordial schedules are expected to be constructed.

Some experience has been gained so far in developing this idea in relation to Space and Time Facets. Though the problems presented by these are comparatively trivial, that very fact has high-lighted the notational problems and
led to some helpful ideas.

In India, there is a lack of opportunity to gain the necessary experience of the problems which arise in this connexion as active industrial life and research, and the associated fundamental research, have not yet set in. However, feeding ourselves on the abstracting periodicals which we take, the investigation is being pushed forward.

If this attempt succeeds, a far greater element of self-perpetuation will be introduced. For not only can new facets of a new specific subject be recognized and inserted in the proper place automatically, but the foci in them can also be recognized and provided with their respective numbers automatically. The provisional findings are being published in the quarterly "Abgila" to invite suggestions which may be incorporated in the final design.

07 Mode of Self-Perpetuation

The mode of self-perpetuation will then have three features.

071 Facet analysis, phase analysis, signature digits and the associated primordial schedules and many other similar elements will make classificatory language highly aglutinative and synthetic. So long as cataclysmic changes do not occur, these elements will make the construction of class numbers to represent new ideas automatic. Each new specific subject will be born with its class number in its pocket, as it were.

072 As the cumulation of small changes (too refractory to be handled in the way mentioned in 071) in a particular main class becomes too great, the Facet Formula for that subject may be reshaped or the primary foci in the array of the first and the succeeding orders of each facet may be re-enumerated. This means that the main class may be provided with a new classification.

At The Hague Conference of the F. I. D. in 1948, for example, the physicists resolved that the time had come for a new classification for physics.

If the classificatory system is designed organically along lines similar to what has been described, physics alone can be redone and repaired and still the scheme as a whole retained.

073 If a kind of cell-division takes place in a main class and there is justification to establish a new main class, it can be done.

0741 Adjustment of the kind mentioned in 071 will be perpetual.

0742 Adjustment of the kind mentioned in 072 will be occasional. It is conjectured that it will be necessary about once in a generation. Perhaps it will not become necessary in the case of too many subjects at one time.
The help of the international associations in the subjects concerned should be sought to determine the subjects which demand change and the lines along which the change should be made.

0743 Adjustment of the kind mentioned in 073 will be even more occasional.

0744 The notational resilience needed to make these adjustments can be ensured if the points mentioned or described in 06 are possible in the classification scheme and are carried out.

0745 The classificatory language can be so designed that all such adjustments can go on in subject after subject as and when its turn comes so that the coherence of the scheme as a whole is never lost.

0746 If this is done, there will be much less dislocation than when a wholesale redesigning of classification is done once in a few years.

0747 Every thirty years, say, the whole scheme might get renewed in this way, unnoticed as it were, even as a living body is said to be renewed in its entirety every seven years.

0748 If a cataclysmic change takes place over the entire field of knowledge at epochs of terrible turbulence, then there will be need to burn the boat, as it were, and begin all over again, perhaps with new notational devices suggested by the features in the cataclysm which overpowered the old system of notation.

The efficiency and the expectation of life of a classificatory language will be measured by the frequency of the need for such a de novo design. It is believed that investing it with the qualities enumerated till now will give them in greater measure than has been possible in the existing schemes of classification.

075 When a change-over to a totally new classification is imperative, it need not be resisted on the ground of the enormous work which the reclassification of all the old materials will involve.

For by assumption the change-over is necessitated by the old knowledge being out-moded. Many of the old materials will not be required for use. It is the new materials that will be in demand. These new materials coming out after a prescribed date may be put on the new scheme. A conversion table may be drawn up to translate the old class numbers into the new and vice-versa. With its aid such of the old materials for which demand arises may be brought from the old sequence to the new. This kind of transfer will progressively diminish. Ultimately the truly dead materials will be left behind in the old sequence.

076 A similar procedure may be adopted also when selected main subjects alone are subjected to new classification at any time as indicated in 072.
077 The international organization needed to keep a self-perpetuating
classificatory system ever in good repair, to have it tested on prescribed
occasions and to design the extra notational features required to meet
onslaughts by perpetual new formations in the field of knowledge, the variety
of personnel which such an organization should comprehend, the division of
labour among them, a possible procedure which may be followed and the way in
which the finalized findings of such an organization may be published and
distributed to the national organizations of the different countries and from them
to the local libraries, have been outlined in the "Review of Documentation" (May
1948).

08 Act of Classifying

The act of classifying, i.e. translating the name of a specific subject
from the natural language to the artificial language of ordinal numbers which
have the features described above, will be similar to that of translating from one
natural language to another. But the resulting translation will be unique, unlike
what will happen if the language into which the translation is made is also a
natural language.

The reasons for this difference are set forth in Section 433 of "Library
Classification: Fundamentals and Procedure" (1942).

081 The first step will, of course, be to determine the specific subject of the
published material.

0811 Since thought is expressed in that material in a natural language with the
varied suggestions and associations which usually scintillate from expressions
in a natural language; and the different phases, facets and foci of the thought so
expressed may be picked up in any order and may be given different emphasis;
the enumerative classifications are not of sufficient help at this stage, even
though fitted with a relative index. Of course the relative index goes some way
to narrow down the number of alternative specific subjects that may be hit upon.
But still some alternatives are possible.

0812 In an analytico-synthetic classificatory language with features like the
one described here, the sieve made of the main classes, the phase analysis,
the facet analysis, the five fundamental elements of which the facets are
manifestations, the unique order into which the phases and the facets will fall
and the mechanism for sharpening the primary foci in the several facets - all
these factors project their helping hands as it were, or throw a searchlight
on the path of the classifier even when he is at the first stage of determining
the specific subject. His thought is canalized at that stage. It is this which
makes the probability that every classifier will arrive at the same specific
subject very high.
In fact, the thought in the published material is analysed into its phases, facets and foci with the aid of the impersonal devices - the phase and facet formulae and the signature digits and the mnemonics, scheduled as well as unscheduled - inherent in the classificatory language itself.

082 The second step is to throw the phases and facets in the proper order.

This is a process of synthesis - synthesizing the elements into which the still unknown specific subject was broken down by the analysis at the first stage.

083 The third step is to translate (1) the main class and (2) each primary focus involved into its ordinal number and to fuse them with the appropriate connecting symbols.

In translating the primary focus, the ready-made schedule can be used if it has been already constructed, or the appropriate primordial schedule can be used. In either case, the sharpening of the focus can be done to the extent demanded, by the classifier himself if the focus in the schedule is not sharp enough.

084 The fourth step is to retranslate the resulting class number into natural language to check if it leads to the name of the specific subject in the natural language.

These stages in the work of classification have been fully set forth and demonstrated with 1,008 graded examples and exercises in the "Library Classification: Fundamentals and Procedure" (1944).

085 The fifth step is to record in the classification schedule and its index, which together form the equivalent to a two-way dictionary linking up the classificatory and the natural languages, the new primary focus, if any, which has been dealt with in the process of translation, so that the strain of fixing its number need not be repeated in future occasions.
Chapter 1

THE SERVICES OF CLASSIFICATION

10 Evolution of Classification

The device of representing reading materials by ordinal numbers was first conceived of solely for mechanizing the arrangement of the materials.

At first the reading materials were assigned serial numbers in the chronological order in which they were taken into the stock. These numbers are called Accession Numbers.

101 When the number of materials increased beyond a limit and their location needed many shelves, bays, rows of racks, tiers, rooms and buildings, the materials were assigned press-marks, which are ordinal numbers whose digits disclose in order the building, the tier, the row, the bay, the shelf and the exact position on the shelf, since otherwise the accession number made one fumble about to find the material.

These press-marks presuppose a fixed position or absolute location for each reading material.

102 If different copies of the same material arrived at different times or, what is equivalent, if different editions of the same reading material arrived at different times or, what is again equivalent, if different reading materials embodying the same specific subject arrived at different times, they will get scattered if the shelves are to be packed progressively without gap. If gaps are left related materials can be shelved together. But it is impossible to divine the size of the gaps to be left at different points. This made absolute location and absolute numbering break down in a growing collection which had to acquire as well as weed out materials continually, as implied in the Fifth Law of Library Science - A Library is a growing organism.

It is relative location - relative to other materials - that is needed.

103 The situation described in 102 led to breaking up the ordinal number used to represent a reading material into two parts, the first part representing the specific subject embodied and the second part representing the particular embodiment of the specific subject. The first part is the Class Number and the second the Book Number or the Document Number, as the case may be.

104 Sometimes a third part also is added to denote the sequence in which the material is housed, in case the materials with the same class number have to be arranged in different sequences, determined by the oddness of size, the frequency of use or any other factor suggested by convenience of various kinds. The third part is the Sequence Number.
In the process of reaching the material, it is the sequence number which will first be used, then the class number and last the book number.

105 It is possible to give arbitrary ordinal numbers to the specific subject as and when they arrive in the library embodied as reading and kindred materials and thereby secure relative location in such a way that all embodiments of the same specific subject are always housed together whenever they arrive in the library.

Even the very names of the specific subjects can be used as ordinal numbers for the purpose.

That is what many of the so-called subject catalogues did in the past in the grouping and arrangement of entries.

An extract of the subject entries alone from a modern dictionary catalogue will present a similar appearance except that the subject headings will be much more minute than in the so-called subject catalogue of the past.

106 As the number of specific subjects increased beyond a certain limit, the unhelpfulness of the alphabetical or any other arbitrary (in the sense of non-filiatory) order of specific subjects became very acute.

It violated the Fourth Law - Save the time of the reader - as the reader had to move forward and backward to pick out reading materials from all possible related classes. It failed to help the Third Law - Every book its reader - as it failed to put related subjects together and thereby to increase the chance of its attracting potential readers coming to a closely related subject.

107 The situation described in 106 led to the representation of specific subjects by ordinal numbers which expressed or translated the names of specific subjects in such a way that if the specific subjects are arranged according to the ordinal numbers representing them, they are in a helpful filiatory order.

Such class numbers have all the vital quality and capacity for organic growth of a natural language, with the additional advantage that filiatory order is always preserved whatever be the number of new specific subjects which have to be interpolated from time to time.

108 Such class numbers can constitute an organic, complete, though artificial, "language of ordinal numbers" which fulfils all the Five Laws of Library Science.

11 Primary Service

The primary service for which a system of class numbers is designed has been to fix a preferred helpful filiatory order among specific subjects,
with infinite hospitality to admit any number of new specific subjects which may arrive at any time in the future and which may be unknown and unknowable at present, and to accommodate each of them in helpful filiatory places among the old ones.

111 Experience has shown that the need for this service is paramount. Its paramountcy is traceable to the subject-approach which is the most frequent among readers. This in its turn is perhaps due to the human mind, as it has evolved and functions today. Melvil Dewey was led to his Decimal Classification by a recognition of this fact. Berwick Sayers and Bliss have written some pages on the subject in the "Introduction to Library Classification" and "Manual of Classification" of the former, and the "Organization of Knowledge" and the "Organization of Knowledge in Libraries" of the latter. The subject is also elaborated in the "Five Laws of Library Science" (1931) and the "Elements of Library Classification" (1946).

112 In the last two of the above-mentioned books, a system of class numbers is shown to be essential to the fulfilment of the Laws of Library Science.

113 The class numbers are available to arrange in a helpful order not merely the reading and kindred materials, but also their Subject Entries in library catalogues and documentation lists.

12 Secondary Services

A secondary service for which the class numbers are also available is the filiatory featuring of merely the names of those specific subjects on which the library has reading and kindred materials or a documentation list has entries.

121 This service, though a by-product, has immense use. It is indeed a deeper service. It is best brought out in the arrangement of the subject entries in the catalogue.

A classified library catalogue, which has to serve several purposes, has two parts - a classified part and an alphabetical part.

122 If the reader's interest is for a particular book or a book by a particular author, the alphabetical part is sufficient by itself to satisfy his want. But if it is interest in a subject which takes him to the library, his wants will be better served if the catalogue can spread before him a full, connected panorama of all the materials on his specific subject, all its sub-divisions and all broader subjects of which it is itself a sub-division. Moreover, few readers are able to name their specific subjects exactly. It is a broader or a narrower subject that is usually thought of. But whatever is brought up and however wide of the mark it may be, the alphabetical part tells him, as it were, "For all books on the subject you mention and on all connected subjects, look up the region of the
Classified Part covered by number so and so." There he finds displayed the full field of his interest. When he enters it he finds all that he was vaguely conscious of having wanted; and indeed it is only then that he is able to know the exact thing he wanted.

123 The function of the number is exhausted as soon as the reader enters the region indicated by it. Thereafter the numbers do not occupy his thought or distract him. His mind is fully occupied with the helpful filiatory way in which names of his reading materials follow one after another. He is delighted. This delight is at bottom due to the satisfaction of unexpressed wants and to the getting of something which he did not know how to ask for. This represents a deeper function to be performed by the library catalogue.

124 It is the duty of the library to meet such unexpressed wants, particularly because an ordinary reader does not know how to give shape to them and state them. For the specialist reader, this will disclose virgin regions of the field of knowledge which needs to be cultivated. The Dictionary Catalogue, with its inevitable alphabetical scattering of subjects instead of collocation, cannot satisfy this want. Its maze of 'see also' directions will virtually tire out the ordinary reader by sending him from pillar to post.

125 It is unchivalrous to say to the reader, as it were, "You declare you can enter the catalogue only with the alphabetical key. Very well, you shall have it! But you will have to use the alphabet not only at the beginning but throughout and to the very end." This is too great a penalty to be imposed upon the reader. It is pushing the 'alphabet' beyond its legitimate function. Real efficiency and gracefulness consist in confining the use of each tool to the purpose for which it is best suited or designed. To display the resources of a library in a filiatory order the correct means is the classified arrangement and not the alphabetical one. As the library catalogue or the documentation list has to do this and as the reader can enter it only with the alphabetical key, the bipartite catalogue with a classified and an alphabetical part is the only suitable one.

126 This secondary service may be called, for convenience, a Search Service. From this point of view classification can be called an Aid for Search.

13 Tertiary Service

A tertiary service which can be got out of a system of class numbers is to know the regions of the field of knowledge which are lying fallow or partially cultivated and need cultivation or further cultivation.

130 Each number constructed to represent a specific subject on which reading and kindred materials exist is like a flag planted on a region being explored or cultivated. This purpose will be served even if a specific subject is represented by any number such as those mentioned in 101 to 106. But it will not show either the depth to which it has been explored or the degree of intensity to which
it has been cultivated. Nor will it show the density, so to speak, of the cultivated regions by which it is surrounded.

131 A class number, which is a systematic translation of the name of the specific subject, will serve all the purposes mentioned in 130 as not served by a non-classificatory number. The structure of the class number - its phases, facets, the sharpness of the foci, the signature digits occurring in it, etc. - will indicate the necessary information.

A class number will therefore be more than a flag; it will be like a tablet with a fund of information inscribed on it.

132 This tertiary service will be of immense use not only to young aspirants just entering the field for cultivation, but will be a convenience also to the veterans in the field.

14 Quaternary Service

It is commonplace knowledge that expressive class numbers form a powerful aid in book selection - to indicate the gaps, the regions thinly represented and so on.
Chapter 2

CLASSIFICATION AS AID FOR SEARCH

2. When classification is used as an aid to search it has some limitations.

21 Effect of being a Cipher

It facilitates search merely by doing its primary service of arrangement well. As the arrangement it mechanizes is by definition helpful, it facilitates service.

211 As there are many equally helpful orders among hundreds of specific subjects, the probability for every reader reaching or exploring his specific subject or even his region of the field of knowledge in just the way which is represented by the chosen system of class numbers is indeed small.

212 Further, the class numbers being ciphers convey no meaning to readers and fail by themselves to give the necessary aid in search.

213 These difficulties are mitigated

(1) in the stack-room, by putting up guides of various sorts - tier guides, gangway guides, bay guides and shelf guides - all bilingual guides mentioning the names of subjects in both classificatory and natural languages.

(2) in the classified part of the catalogue, by inserting bilingual guide-cards in a similar manner.

214 The names in the natural language are intelligible to the reader. The names in the classificatory language only act, if at all, as remembrancers that there is an order aimed at in the arrangement; and they may be even ignored by the reader.

215 To know where to land on the classified part of the catalogue or where to begin in the stack-room without undue fumbling about in starting his search, the reader should be helped by translating the word he uses to express his subject - be it specific or more extensive or less extensive than what he really needs - into the class number. This the alphabetical part of the catalogue does.

2151 In an enumerative classification, its own alphabetical index to the schedule will by itself be sufficient.

2152 In an analytico-synthetic classification, such an index is not given along with the schedule. The index lists only the primary foci, which cannot be
specific subjects as stated in 03. The catalogue has therefore to provide in the alphabetical part an index of just those foci that are represented on the shelves.

216 These supplementary aids by the guides and the catalogue are necessary as the intention is that the reader should derive from the classification its search service with the least help from the library staff.

22 Effect of being Non-Commutative

Another limitation of classification as an aid for search emerges from a dilemma in which classification is inevitably caught.

221 To meet the varied approaches which readers are known to make to a specific subject, which is multiphased and/or multifaceted, it is desirable that the classification should provide alternative class numbers for a subject - one for each permutation of the phases and again for each permutation of the facets in each phase.

222 The above can be put briefly as "making the phase and facet-formulae commutative".

223 But a commutative phase or facet-formula implies admission of synonyms into the classificatory language. And this has to be ruthlessly avoided if the classification should be fit to do its primary service, which is arrangement. This has been stated among the essential qualities of a classification in 0653.

224 The above can be put briefly as "Phase and facet-formulae should be strictly non-commutative".

225 Indeed one of the faults of the U.D.C. is that it has made the phase-formula commutative to help classification to become a better aid for search. But to that extent, it has made it unfit as an aid for mechanizing arrangement.

23 Aid of the Catalogue

The catalogue can help classification out of this dilemma by providing alternative class index entries for the specific subject - as many class index entries as there are permutations of its phases and facets. Of course, all these class index entries will point to the same class number.

Compound primary foci also will call for alternative class index entries:

Examples

(1) For the specific subject (given in 0331)
   L2153:4725 Cancer of the soft palate
   the class index entries should be
Cancer  Soft palate  see  L2153:4725
Soft palate  Cancer  see  L2153:4725

(2) For the specific subject (given in 052)
LOZ  Medicine for Lawyers

the class index entries should be
Medicine biased by Law  see  LOZ
Law biasing Medicine  see  LOZ

(3) For the specific subject (given in 041)
L2576  Study of intestinal motor nerves

the class index entries should be
Intestines  Motor nerves  see  L2576
Motor nerves  Intestines  see  L2576

231 In whatever order, the primary foci in the facets involved are brought up in the mind of the searcher, there is a class index entry in the catalogue to help him. It takes him by hand and tells him the exact spot of the classified part of the catalogue he should look up. The class number given at the end of the class index entry gives him that information. In the classified part, he will find arranged in close succession under that class number the entries of all the materials he had been searching for - whether they be main entries or cross-reference entries.

232 There will be no loss of time on the part of the reader - either subjective or objective time.

2321 At the time of search, all the entries in the classified part of the catalogue need not be scanned, as the entries searched will all be together;

2322 Nor need all the entries in the alphabetical part be scanned, as there is a definite entry into which the reader will land whatever be the primary focus with which he starts.

2323 The only scanning will be due to the existence of synonyms in the natural language used.

2324 To hit upon the preferred term, a trial and error method must be adopted.

2325 Even this delay can be minimized by a judicious use of "See" entries.

233 Viewed as part of an aid for search, the catalogue has to be fitted:

(1) In the alphabetical part, with as many class index entries as the number of permutations of the phases, facets and components of
compound primary foci as the specific subject presents; and

(2) In the classified part, with as many main or cross-reference entries as there are reading and kindred materials.

234 The size of the catalogue will vary

(1) In the alphabetical part, with the number of specific subjects and the number of phases, facets and compound primary foci represented in the collection searched; and

(2) In the classified part, with the number of reading and kindred materials to be catalogued or listed.

235 The time taken in making the catalogue will increase

(1) With the degree of intension of the specific subjects to be searched; and

(2) With the number of reading and kindred materials to be catalogued or listed.

236 In regard to size and preparation time involved,

(1) Every new reading and kindred material will add to the classified part; but

(2) it will not add to the alphabetical part unless it brings up a new specific subject and even then it will add only as many new entries as it has primary foci not listed already.

24 Difficulties in Documentation

If the collection of reading materials to be searched has only ordinary books embodying macroscopic units of thought, - in book-search, as we may call it, for shortness - the catalogue may be able to bear the load of the additional class index entries indicated in 21 and its sub-divisions. For the number of phases, facets and compound primary foci brought up by the specific subjects embodied will be small, and therefore the number of their permutations will also be small.

241 But if the reading materials to be searched include articles in periodicals and other materials embodying microscopic units of thought with many phases, each phase having many facets and some facets having compound primary foci - in documentation-search, as we may call it for shortness - the extra load put on the alphabetical part of the documentation list by the necessary additional class index entries to answer all the permutations of the many phases,
facets, etc. will be prohibitively large, as they will increase in number with the steepness of the factorial, i.e. the gamma, function.

Example

Let the specific subject be the following one given in 052:

\[ L2153:4725:63129:B28 = \text{Statistical study of the radium treatment of cancer in soft palate.} \]

This specific subject presents the following four elements to be permuted

(1) Soft palate;
(2) Cancer;
(3) Radium treatment; and
(4) Statistical study.

In theory it will therefore demand the following 24 class index entries:

   \[ \text{See } L2153:4725:63129:B28 \]

   \[ \text{See } L2153:4725:63129:B28 \]

   \[ \text{See } L2153:4725:63129:B28 \]

   \[ \text{See } L2153:4725:63129:B28 \]

   \[ \text{See } L2153:4725:63129:B28 \]

   \[ \text{See } L2153:4725:63129:B28 \]

   \[ \text{See } L2153:4725:63129:B28 \]

   \[ \text{See } L2153:4725:63129:B28 \]

   \[ \text{See } L2153:4725:63129:B28 \]


It is likely that a reader may begin his search with a less sharp focus in any or all the phases and facets. Readers generally think that a sharp focus
will not be listed in catalogues and documentation lists as the past has accustomed them only to broad foci being mentioned hitherto in catalogues.

Example

In the organ facet, for example, they may start with 'palate' or even 'mouth'. For theoretical completeness, let us assume the possibility of starting with 'digestive system' also.

So also, in the problem facet, they may begin to search with the word 'tumour', or 'structural disease'. For theoretical completeness, let us assume the possibility of starting with 'disease' also.

Similar considerations will arise with the handling facet of which 'radium treatment' is focus and with the second phase 'statistical studies'.

243 Properly speaking, however, we must allow for the reader to bring up any one of the links in the chain of the primary foci occurring in the specific subject or its class number and any permutation of them.

Example

Here is the chain for the specific subject taken as example in the preceding sections

<table>
<thead>
<tr>
<th>L</th>
<th>= Medicine</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2</td>
<td>= Digestive system</td>
</tr>
<tr>
<td>L21</td>
<td>= Mouth</td>
</tr>
<tr>
<td>L215</td>
<td>= Palate</td>
</tr>
<tr>
<td>L2153</td>
<td>= Soft palate</td>
</tr>
<tr>
<td>L2153:4</td>
<td>= Disease of soft palate</td>
</tr>
<tr>
<td>L2153:47</td>
<td>= Structural disease of soft palate</td>
</tr>
<tr>
<td>L2153:472</td>
<td>= Tumour of soft palate</td>
</tr>
<tr>
<td>L2153:4725</td>
<td>= Cancer of soft palate</td>
</tr>
<tr>
<td>L2153:4725:6</td>
<td>= Treatment of cancer of soft palate</td>
</tr>
<tr>
<td>L2153:4725:63</td>
<td>= Treatment of cancer of soft palate by chemical substances</td>
</tr>
<tr>
<td>L2153:4725:631</td>
<td>= Treatment of cancer of soft palate by a chemical element</td>
</tr>
<tr>
<td>L2153:4725:6312</td>
<td>= Treatment of cancer of soft palate of the Group 2</td>
</tr>
<tr>
<td>L2153:4725:63129</td>
<td>= Treatment of cancer of soft palate by Radium</td>
</tr>
<tr>
<td>L2153:4725:63129:B</td>
<td>= Mathematical study of above</td>
</tr>
<tr>
<td>L2153:4725:63129:B2</td>
<td>= Algebraical study of above</td>
</tr>
<tr>
<td>L2153:4725:63129:B28</td>
<td>= Statistical study of above.</td>
</tr>
</tbody>
</table>
There are thus 17 links in the chain of this specific subject. To be theoretically complete, the catalogue should give factorial 17 class index entries to provide for all possible terms with which readers may start their search for the materials on this subject. Factorial 17 is 355, 687, 428, 226, 000 \(3.6 \times 10^{14}\)

Imagine each of the thousands of specific subjects being given exhaustive class index entries in this manner.

244 On this basis, the size of the documentation list will make it utterly useless. Nor can the time taken to make all these entries be spared even if the task of documentation is entrusted to one international centre only, assuming that such ideal world co-operation is possible.

245 If this is the only way in which the catalogue and the classification can jointly serve as an aid for search, we must reject them for this purpose and think of other aids.
Chapter 3

CHAIN PROCEDURE

3. The need to abandon the use of Classification cum Catalogue as an aid for search has been considerably mitigated by the Chain Procedure first formulated in the "Theory of Library Catalogue" (1938) implemented in the "Dictionary Catalogue Code" (1945) and the second edition of the "Classified Catalogue Code" (1945) and simplified considerably in the "Library Catalogue: Fundamentals and Procedure" (1950).

According to the prescription of the chain procedure, there should be only one class index entry for each link in the chain.

Example

In the case considered in 243, there will be only 17 class index entries instead of factorial 17. These will be the following:


For materials on the above subject see the classified part of the catalogue under the following Class Number and all its further sub-divisions

\[ L2153:4725:63129:B28 \]

In the rest of the entries, the portion underlined in the above entry will be replaced by "See"


\[ \text{See } L2153:4725:63129:B2 \]


\[ \text{See } L2153:4725:63129:B \]


\[ \text{See } L2153:4725:63129 \]


\[ \text{See } L2153:4725:6312 \]


\[ \text{See } L2153:4725:631 \]


\[ \text{See } L2153:4725:63 \]
See L2153:4725:6

(9) Cancer. Soft palate.  
See L2153:4725

(10) Tumour. Soft palate.  
See L2153:472

See L2153:47

See L2153:4

(13) Soft palate.  
See L2153

(14) Palate.  
See L215

(15) Mouth.  
See L21

(16) Digestive system.  
See L2

(17) Medicine.  
See L

Some of the above, like 2, 3, 5, 6, or 7 are only theoretical provisions.

There will be no need for them in practice and they may be omitted. Thus, the class index entries to be written will be only 12.

311 Links like the one mentioned at the end of 31 which need not be entry words of class index entries are called auxiliary links.

312 Among the conjunction symbols also, some will be substantial like those beginning with zero and others will be auxiliary.

313 Substantive conjunctive symbols will be represented in headings of class index entries as connecting words.

314 Auxiliary conjunctive symbols will not figure in headings of class index entries.

32 The presumption is that the classified part of the documentation list will have adequate guide cards whose tabs will give class numbers and their meanings in natural language if it is in cards and will be provided with well-featured class number headings, and that the verso top corner and recto top corner of the pages will contain inclusive class numbers to guide the location of the main entries of the materials.

33 The class index entries derived by the chain procedure coupled with the minutely classified arrangement of the main entries of the reading and kindred materials will have all the necessary qualities needed in an aid for search.
(1) The search will be exhaustive; and

(2) There will not be much loss of time in searching.

Example

Whichever of the factorial 17 ways in which the reader may bring up his specific subject for search, the 17 entries of the chain procedure will be sufficient to make the search exhaustive and expeditious.

To make illustration easier, let us consider any 24 ways represented in the example in 241.

24 of 241 is identical with 1 of 31.

If the approach is as in 23 or 22 or 21 or 20 or 19 of 241; 1 of 31 will catch the eye without any loss of time and it will put us at once exactly at the right spot in the classified part.

If the approach is as in 18 or 17 or 16 or 15 or 14 or 13 of 241; 4 of 31 will catch the eye without difficulty. This will put us at the spot of the classified part where materials on the 'radium treatment of cancer of the soft palate' stand together. There, as we run the eye down the guide cards or the feature-headings which follow, the one with the caption 'Statistical study' will soon catch the eye.

If the approach is as in 12, 11, 10, 9, 8 or 7 of 241: 9 of 31 will catch the eye without difficulty. This will put us at the spot of the classified part where materials on the 'Cancer of the mouth' stand together. There, as we run the eye down the guide cards or the feature-headings which follow, the one with the caption 'Radium treatment' will be easily picked up and a further move of the eye will pick up the one with the caption 'Statistical methods'.

If the approach is as in 6 or 5 or 4 or 3 or 2 or 1 of 241: 13 of 31 will catch the eye without difficulty. This will put us at the spot of the classified part of the catalogue where materials on the 'Medicine of the soft palate' stand together. There, as we run the eye down the guide cards or the feature-headings which follow, the ones with the caption 'Cancer', 'Radium treatment' and 'Statistical study' will with ease be picked up in succession.

Further,

(1) if the scheme of classification is built so as to respect filiation among specific subjects and to individualize them however great their intention
(2) if the catalogue code is framed with precision and

(3) if the chain procedure is followed:

i. There is a definite helpful division of labour between classification and catalogue;

ii. One does not attempt to do what is better done by the other;

iii. While the classification helps one to slide down the chain of classes in the direction of increasing intensities, the class index entries help in climbing up the chain in the direction of increasing extension;

iv. They mutually detect and correct each other's faults;

v. The services of arrangement and search get well-interlocked; and

vi. Considerable economy results.

Indeed the symbiosis between classification and catalogue becomes perfect and productive.

While the chain procedure will make the search exact and expeditious, the question remains if the cost, in time, manpower and money involved in setting up this aid for search, i.e. in making the class index entries demanded by it can be minimized still further in any way.

One method of effecting economy will be to avoid duplication of the preparation of the documentation list at local libraries, but to get the work done only at the national documentation centres; and it will be even more economical if it is done at one international centre.

The documentation list may be printed either on cards or in other forms and supplied to all local libraries. It is a matter for research in the technique of organization to eliminate time-lag while centralizing in this manner. Such an organization is possible and has been outlined in the recent report of the Indian Library Association on "Bibliographical Service" to the Division of Libraries of Unesco and also in the "Library Development Plan" (1950), in the fascicule of the "Review of Documentation" entitled "Classification and International Documentation" (1948) and also in Reference Service and Bibliography (1940).

It must be possible to harness teletyping and make the National Documentation Centre not only do the search but also flash the result to any local library which needs it for its clientele.
38 Though the symbiotic integration of an individualizing classification and cataloguing by the chain procedure leads to a considerable saving, it fails to have certain other potentialities.

381 It is desirable that the entries in the classified part of the documentation list should contain abstracts of the materials documented and that all the abstracts located by the search should be cheaply and rapidly reproduced by photography or any other process and copies be supplied to the reader if he so desires.

382 It is even more desirable if the abstracts can be reproduced by teletyping or television or any other similar means at the reader's end, however far he may be.

383 The copying and transmitting will have to be by machinery.

384 If the aid for search is only classification cum catalogue, the entries located by it will have to be pulled out from the file by hand, copied, or transmitted, and then restored to their places in the files.

3841 As a result of frequently handling the cards in this way, casual errors may occur:

   (1) Errors that occur while picking out, will affect the exhaustiveness of the service on that occasion; and/or
   
   (2) Errors that occur while restoring the entries will affect the exhaustiveness of the service on future occasions.

3842 The time taken will increase with the number of entries which the search brings out.

385 To eliminate chances for casual error and to reduce the delay in service, it is desirable to leave the picking out and the replacing of the entries, in the hands of machinery.

386 To do this effectively:

   (1) the aid for search;
   (2) the device for picking out and replacing entries; and
   (3) the device for copying or teletransmission

should be interlocked in series.

387 To make the aid for search fit for such interlocking, it too should be a machine.
Chapter 4

CODING

4. Coding may be defined as the translation of the names of specific subjects into a system of written symbols, suitable for representation as patterns of pinholes, punch-holes, slots, photographic spots, magnetic spots, etc., which may be searched by machinery.

Note: The above definition is in conformity with the suggestion of a small meeting at Unesco House, where it was felt that the term 'coding' should not be made to denote the final representation as patterns of pinholes . . . . . magnetic spots, etc. as these patterns are themselves equivalent in thought content to the written symbols.

4.1 The Issues

The following issues arise:

(1) Can the system of written symbols be arbitrary, i.e. ruthlessly indifferent to the filiation among specific subjects and utterly without any regard to any of the associative relations with which human memory invests the terms in a natural language? In other words, can the system of written symbols be severely non-associative?

(2) Can the system of written symbols be those of a non-individualizing, static, enumerative classificatory language which respects associative memory to a limited extent?

(3) Should the system of written symbols be an individualizing, self-perpetuating or dynamic, analytico-synthetic classificatory language of the type prescribed in Chapters 0 and 1, which canalizes associative memory in a unique, objective way?

(4) Can patterns be provided to correspond to all the different symbols needed by an analytico-synthetic classificatory language, say

   i. corresponding to all the letters, capital and small, of the Roman or other alphabet;

   ii. Arabic numerals; and

   iii. connecting symbols such as those mentioned in 06532.

(5) There are likely to be 64 different symbols having distinctive ordinal values. Can the design of the machinery be of the open variety so as to keep pace with the addition of new symbols which the classificatory
language used in coding will have to make in order to keep pace with the new formations in the field of knowledge in the form of either new main classes or new types of relations or any other feature? Or will the machinery be able, in some way, to take care of such additional symbols?

42 It is the consumers (readers who are the ultimate consumers and reference librarians who are the intermediate consumers) who should have the final say in deciding the first three issues.

43 It is the producers (the engineers who design the machinery) who should have the final say in deciding the last two issues.

44 It is for capital to decide,

(1) in case the consumers and the producers arrive at an agreed decision, whether it is a financially worthwhile proposition; or

(2) in case the consumers and the producers cannot agree, whose decision is a financially worthwhile proposition.

45 The ultimate decision and direction should be based on the Sense of Values, which prevails in the community in respect to

(1) not only time, manpower and money; but also intangible factors like

(2) providing for the community's needs at the vital, mental and spiritual levels; and

(3) ensuring that each individual - the creative, in particular - gets every possible facility to blossom forth to his own fulness, along his own specific lines and at the maximum speed of which he may be capable.

This decision should be made at the national level and even better at the international level.
Chapter 5

DISCUSSION OF THE ISSUES

51 Consumers' Issues

511 J. Samain of Paris began with a ruthlessly non-associative code language in designing his machine for selecting punched cards.

5111 He is in close touch with the documentation centres where his machine has been set up and checks up, from time to time, the code language being developed arbitrarily in such centres.

5112 He is said to have gradually felt the need for making the code language associative to some extent.

5113 This is said to be due to the disparity between the rate at which the searching speed of the machine can be stepped up and the rate at which the materials to be searched mount up.

5114 It is this factor which drives him to a slightly associative classificatory language of a few hundreds of classes in which he stores his punched cards - the dominant classes as he calls them.

5115 This veering round towards a classificatory language is however of no significance in deciding the first three issues. For it is caused simply by the selection time (the number of items to be selected from divided by the speed of selection) being greater than the desired value. The selection time can be restored to the desired value by improving the machinery so as to attain greater speed.

512 Henri Clavier's new design, on the other hand, makes use of slotted cards in a way which physically represents the facets of the specific subject as yielded by the facet analysis described in 02. This is a case where the designer of the machinery recognizes the advantage of using an analytico-synthetic classificatory language for coding.

513 G. Cordonnier's design goes even a step further. In the process of search, it physically carries out the lamination of the facets described in 04.

514 It will be an advantage if a comparative study of the coding used by different designers is made in relation to the classificatory technique. It will yield results helpful to the classificationist as well as to the designer of the selecting machinery. Unesco may well promote such a comparative study.

515 A good classificatory language is, in any case, necessary for arranging the reading materials in the library, and the classified entries in the catalogue or
documentation list. As experience goes today, it should be an analytico-synthetic self-perpetuating classificatory language. The library staff has to handle that language. It will mean less strain for them if they can use the same language both for arranging the reading materials and for putting the questions of the readers across to the machine.

516 It is a matter of experience in reference service that helping the reader to enunciate his specific subject exactly is often half the battle. It often does not disclose itself to the reader. The primary foci are not all recognized; nor is the degree of their sharpness correctly recognized.

5161 Whatever primary or compound focus occurs in the specific subject, the reference service has to start with it. The alphabetical index then puts the reader and the reference librarian at a certain spot in the classified part of the catalogue.

5162 The panorama of guide cards among the schedule-cards standing arranged in a helpful filiatory way in the neighbourhood of that spot acts as a remembrancer and makes him recognize the hitherto unexpressed name of his specific subject. This remembrancer service is shown by experience to be quite essential.

This is like the choice of our clothes, fountain pen or food or any other articles being facilitated by being shown a complete assortment of them.

5163 This essential help can be rendered to the reader only if an analytico-synthetic classificatory language is used. As such a classificatory language is essential for service, it will add to economy if it itself is used for coding also.

This has been illustrated in Chapter 3.

517 Hundreds have been the attempts to represent specific subjects by arbitrary symbols without any organic relation to the ideas represented. Practically in all such cases a breakdown has come sooner or later. In other words, the expectation of life of such a coding has been inconveniently short. On the other hand, the expectation of life of a classificatory language can be many decades; and the coding can indeed be made nearly self-perpetuating by properly designing it.

518 The consumer's recommendation can therefore be taken to be in the negative with regard to the first two issues and in the affirmative with regard to the third issue framed in 41.

52 Producers' Issues

The answers to the last two issues should be solicited from those who specialize in the design of machinery for search. A binary base will make
class numbers unworkably long. A base of 32 may prove quite sufficient. Can this base be used for the machinery?

53 Final Decision

Final decision must be made regarding arrangements made for:

(1) Designing coding, i.e. a satisfactory classificatory language if such a coding is favoured; and

(2) Designing the pattern of physical representation of the coding in terms of elements which are suitable for use in machinery;

(3) Designing the machinery for making the search rapidly;

(4) Designing the copying and teletransmission machinery;

(5) Designing the interlocking of all this machinery for expeditious overall service.

531 The organization for the first factor mentioned in 53 has been outlined in "Classification and International Documentation" (May 1948) which appeared as a fascicule of the "Review of Documentation" of the F. I. D. Here are a few details:

(1) Provision must be made for research personnel to work out the 120 primordial schedules mentioned in 0655. This should be done immediately.

(2) There should be a provision for a permanent Bureau of Classification Design to watch the effects of the onslaught on it of new formations in the field of knowledge and make the scheme of classification face up to all of them.

(3) The schedules in the different subjects should be carried to increasing degrees of minuteness or atomization. This will have to be done by persons who have had training in the respective subjects as well as the design of classification. At least a thousand specific-subject regions can be said to be in a state of active cultivation today. Each of these specialized regions should spare at least one of its specialists for this work of maintaining its schedule up to date.

(4) Apart from the above-mentioned persons who should be full-time, panels of experts working in these subjects should be established for consultation.

(5) The abstracting periodicals and other documentation lists produced under national and international auspices should use the classificatory language used for coding.
(6) Such an organization need not mean regimentation or suppression of individuality as there will be considerable scope for creative work by individuals in the team work which is needed to meet the requirements of international documentation.

54 Present State of Work

The foundations for a self-perpetuating scheme of classification are being laid by the work in progress in India, along lines which point to the need for the construction of the 120 primordial schedules mentioned in 6655. But India is not developed sufficiently to provide the necessary concrete experience which can exist only in libraries attached to special industries and institutions engaged in fundamental research at great depths. Facilities are needed for those engaged in the work to get this concrete experience and for international co-operation in the matter.
Chapter 6

CONCLUSION

There are five objectives to be achieved. They are achieved best by different aids. There are certain essential qualities which these aids should have. It will be a convenience if the common factor of these qualities is borne in mind and respected, and if all the different aids respect the distinctive qualities of one another.

The following table brings these elements together:

<table>
<thead>
<tr>
<th>Objective</th>
<th>Aid</th>
<th>Qualities needed</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Arrangement of reading and kindred materials.</td>
<td>Classification</td>
<td>The base or number of symbols used, should be large.</td>
<td></td>
</tr>
<tr>
<td>11. Class number should be short</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Class number should be thrown into relief with its different constituent parts standing out distinctly so as to be easy of recognition.</td>
<td></td>
<td>The class number should be faceted and for this purpose a distinctive species of symbols like punctuation marks is necessary.</td>
<td></td>
</tr>
<tr>
<td>13. There should be no homonyms or phases of a class synonyms among number should be the class non-commutative numbers.</td>
<td></td>
<td>Suitable notational devices like decimal fraction notation, octave notation, signature digits, primordial schedules etc., or their equivalents are necessary.</td>
<td></td>
</tr>
<tr>
<td>14. The system of class numbers should provide infinite hospitality to accommodate many new co-ordinate as well as subordinate classes in helpful places</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Objective</th>
<th>Aid</th>
<th>Qualities needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 June 1950</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Objective</strong></td>
<td><strong>Aid</strong></td>
<td><strong>Qualities needed</strong></td>
</tr>
<tr>
<td>2. Canalization of the determination of the specific subject of any reading and kindred material.</td>
<td>Classification 21.</td>
<td>between any two class numbers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Help to readers in the exact enunciation of their specific subjects.</td>
<td>Classified part 31.</td>
<td>A system of class numbers should constitute an artificial language of ordinal numbers of an analytic-synthetic type.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Rapid selection from among a large heap of entries describing reading and kindred materials.</td>
<td>Machinery with 41.</td>
<td>The order of entries is indifferent.</td>
</tr>
</tbody>
</table>

**2. Canalization of the determination of the specific subject of any reading and kindred material.**

Classification 21.
The class number should be expressive, i.e. should show in its parts the various phases and facets which are presented by the specific subject.

**3. Help to readers in the exact enunciation of their specific subjects.**

Classified part 31.
The alphabetical part of the classification schedule should help for deriving Subject Headings from Class Numbers can do this.

**4. Rapid selection from among a large heap of entries describing reading and kindred materials.**

Machinery with 41.
The task of restoring each entry to its original place should be eliminated.

The order of entries is indifferent.
<table>
<thead>
<tr>
<th>Objective</th>
<th>Aid</th>
<th>Qualities needed</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. To avoid putting in for a specific subject as many entries catalogue as it has facets, phases and foci.</td>
<td>A single-entry system of catalogue, used by the machinery, whichever be the constituent phase or facet or focus of a specific subject mentioned.</td>
<td>The single entry should have in it the pattern corresponding to each of the phases, facets and foci of the specific subjects.</td>
<td></td>
</tr>
<tr>
<td>6. Easy change-over from class numbers table for class numbers to patterns in the machinery.</td>
<td>A conversion- from class numbers table for class numbers to patterns in the machinery.</td>
<td>The conversion should be automatic, needing no thinking or reversion to the name of the specific subject.</td>
<td>The number of symbols used in the class numbers should be the same or slightly less than the number of basic patterns in the machinery.</td>
</tr>
<tr>
<td>62. The machinery should allow infinite hospitality.</td>
<td></td>
<td></td>
<td>The total length of the code patterns should not be limited.</td>
</tr>
</tbody>
</table>
## INDEX

Reference is to Chapters and Sections of Chapters

\[ \text{i.r.t.} = \text{in relation to} \]
\[ \text{r.i.r.t.} = \text{referred in relation to} \]

<table>
<thead>
<tr>
<th>Term</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abgila</td>
<td>065</td>
</tr>
<tr>
<td>Absolute location</td>
<td>102</td>
</tr>
<tr>
<td>Analytico-synthetic classification i.r.t.</td>
<td>0812</td>
</tr>
<tr>
<td>classifying</td>
<td>41 and 51</td>
</tr>
<tr>
<td>coding</td>
<td>003</td>
</tr>
<tr>
<td>emergence</td>
<td></td>
</tr>
<tr>
<td>Arranging service i.r.t.</td>
<td>111</td>
</tr>
<tr>
<td>classification</td>
<td>515</td>
</tr>
<tr>
<td>coding</td>
<td></td>
</tr>
<tr>
<td>Array</td>
<td>0221</td>
</tr>
<tr>
<td>Autonomy to classifier</td>
<td>018</td>
</tr>
<tr>
<td>Bliss</td>
<td>111</td>
</tr>
<tr>
<td>Book number</td>
<td>103</td>
</tr>
<tr>
<td>Broad focus</td>
<td>031</td>
</tr>
<tr>
<td>Building settlement analogy</td>
<td>063</td>
</tr>
<tr>
<td>Bureau of Classification Design</td>
<td>531</td>
</tr>
<tr>
<td>Canalization</td>
<td>0812</td>
</tr>
<tr>
<td>Canons</td>
<td>061</td>
</tr>
<tr>
<td>Capital</td>
<td>44</td>
</tr>
<tr>
<td>Catalogue i.r.t.</td>
<td>23</td>
</tr>
<tr>
<td>search-service</td>
<td>24</td>
</tr>
<tr>
<td>&quot; in documentation</td>
<td></td>
</tr>
<tr>
<td>Centralization i.r.t.</td>
<td>35</td>
</tr>
<tr>
<td>chain procedure</td>
<td></td>
</tr>
<tr>
<td>universal classification</td>
<td>016</td>
</tr>
<tr>
<td>Chain of classes</td>
<td>024</td>
</tr>
<tr>
<td>Chain procedure i.r.t.</td>
<td>3</td>
</tr>
<tr>
<td>search service</td>
<td>024</td>
</tr>
<tr>
<td>subject heading</td>
<td></td>
</tr>
<tr>
<td>Change-over to new classification</td>
<td>025</td>
</tr>
<tr>
<td>Class index headings</td>
<td>024</td>
</tr>
<tr>
<td>Class number i.r.t.</td>
<td></td>
</tr>
<tr>
<td>coding</td>
<td>41, 42 and 51</td>
</tr>
<tr>
<td>emergence</td>
<td>103 and 107</td>
</tr>
<tr>
<td>Classification i.r.t.</td>
<td>21</td>
</tr>
<tr>
<td>cipher</td>
<td></td>
</tr>
<tr>
<td>emergence</td>
<td>001</td>
</tr>
<tr>
<td>evolution</td>
<td>10</td>
</tr>
<tr>
<td>non-cummulativeness</td>
<td>22</td>
</tr>
</tbody>
</table>
search service  
coding  
Classification cum cataloguing  i.r.t.  
copying service  
search service  
teletransmission  
Classificatory language  i.r.t.  
emergence  
qualities  
Classified catalogue code  
Classifying  
Clavier  
Coding  i.r.t.  
abstracting periodicals  
documentation lists  
factors involved  
Colon Classification  i.r.t.  
emergence  
main classes  
octave notation  
phase analysis  
Colon classification  
Complex focus  
Compound focus  
Compound primary focus  
Concepts  
Conclusion  
Connecting symbols  
Consumers' issues  i.r.t.  
discussed  
enumerated  
Conversion table  
Cordonnier  
Decimal Classification  i.r.t.  
emergence  
main classes  
Dewey  
Dictionary catalogue code  
Documentation  i.r.t.  
search service  
social phenomena  
Document number  
Double-compound focus  
Double laminate  

2  
41, 42 and 51  
38  
3633  
38  
001  
06  
3  
08  
512  
53  
53  
4  
003  
0122 to 01233  
0222  
052  
064  
053  
033  
041  
007  
6  
0653  
51  
42  
075  
513  
001  
0121  
111  
3  
34  
002  
103  
0332  
0332
Elements of library classification r.i.r.t. arranging service 111
helpful order 062
Enumerative classification i.r.t.
    classifying 0811
    emergence 001
Expectation of life i.r.t.
    de novo design 0748
    self-perpetuation 063
Evolution of classification

Facet 021
Facet analysis 02
Field of knowledge i.r.t.
    infinity of size 017
Filiatory featuring 12
Five laws of library science 111
Fourth Law 106
Fundamental elements 0652

Generalia main class 011
Guide 211

Hague Conference i.r.t.
    Classification of physics 072
    Octave notation 0222
Helpful order 062
Homonyms 06
Hospitality in Array 0221
    - of main class 014
Hybrid classification 002
Hospitality in chain 0241

India 54
Indian Library Association r.i.r.t.
    documentation centre 36
    primordial schedules 54
    optional facets 065
Introduction to library classification 111
Issues on coding 41

Journal of Documentation 063

Laminated focus 033
Library catalogue: Fundamentals and procedure 3
<table>
<thead>
<tr>
<th>Library classification: Fundamentals and procedure r.i.r.t.</th>
</tr>
</thead>
<tbody>
<tr>
<td>qualities of classificatory language</td>
</tr>
<tr>
<td>steps in classifying</td>
</tr>
<tr>
<td>uniqueness of class number</td>
</tr>
<tr>
<td>Laws of Library Science</td>
</tr>
<tr>
<td>Library development plan</td>
</tr>
<tr>
<td>Link</td>
</tr>
<tr>
<td>Local service</td>
</tr>
<tr>
<td>Lower limit</td>
</tr>
<tr>
<td>Main classes</td>
</tr>
<tr>
<td>Manual of classification</td>
</tr>
<tr>
<td>Mnemonics</td>
</tr>
<tr>
<td>&quot; unscheduled</td>
</tr>
<tr>
<td>Octave notation</td>
</tr>
<tr>
<td>Optional facet</td>
</tr>
<tr>
<td>Order of link</td>
</tr>
<tr>
<td>Organization for classification</td>
</tr>
<tr>
<td>&quot; designing of coding</td>
</tr>
<tr>
<td>&quot; documentation</td>
</tr>
<tr>
<td>Organization of knowledge in libraries</td>
</tr>
<tr>
<td>Organization of knowledge</td>
</tr>
<tr>
<td>Phase analysis</td>
</tr>
<tr>
<td>Philosophy of library classification</td>
</tr>
<tr>
<td>Preliminaries</td>
</tr>
<tr>
<td>Press-marks</td>
</tr>
<tr>
<td>Primary focus</td>
</tr>
<tr>
<td>Primary service</td>
</tr>
<tr>
<td>Primordial schedules r.e.t.</td>
</tr>
<tr>
<td>emergence</td>
</tr>
<tr>
<td>research</td>
</tr>
<tr>
<td>work in progress in India</td>
</tr>
<tr>
<td>Producers' issues r.e.t.</td>
</tr>
<tr>
<td>discussion</td>
</tr>
<tr>
<td>enumerated</td>
</tr>
<tr>
<td>Prolegomena to library classification</td>
</tr>
<tr>
<td>Qualities of classificatory language</td>
</tr>
<tr>
<td>Quaternary service</td>
</tr>
</tbody>
</table>
Ranganathan  See

Classified catalogue code
Colon classification
Dictionary catalogue code
Elements of library classification
Five laws of library science
Journal of documentation
Library catalogue: Fundamentals and procedure
Library classification: Fundamentals and procedure
Library development plan
Philosophy of library classification
Prolegomena to library classification
Reference service and bibliography
Review of documentation
Theory of library catalogue

Reference service and bibliography  36
Relative location  102
Remembrancer service  5162
Review of documentation  r.i.r.t.
   Organization for classification  027
   " designing of coding  531
   " documentation  36

Samain  51
Sayers  111
Search service  126
Secondary service  12
Selection time  5115
Self-perpetuation  i.r.t.
   desirable qualities  063
   mode  07
Sense of values  45
Sequence number  104
Service of classification  2
Sharpness of focus  023
Signature digits  0655
Special collections  015
Specific subject  03
Steps in translating  081
Subject catalogue  105
Subject headings  024
Simple focus  032
Symbiosis  331
Synonyms  06
<table>
<thead>
<tr>
<th>Term</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teletyping</td>
<td>37</td>
</tr>
<tr>
<td>Terminology</td>
<td>006</td>
</tr>
<tr>
<td>Tertiary service</td>
<td>13</td>
</tr>
<tr>
<td>Theory of library catalogue</td>
<td>3</td>
</tr>
<tr>
<td>Third Law</td>
<td>106</td>
</tr>
<tr>
<td>Translating</td>
<td>081</td>
</tr>
<tr>
<td>True main class</td>
<td>0113</td>
</tr>
</tbody>
</table>

Unesco **i.r.t.**

- Comparative study of coding | 514 |
- Universal classification    | 016 |
- Universal Decimal Classification **i.r.t.** |
  - commutativeness            | 225 |
  - emergence                  | 002 |
  - phase analysis             | 051 |

Upper limit | 013 |

Unscheduled mnemonics | 064 |

Values, sense of | 45 |