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THEORY
OF
KNOWLEDGE CLASSIFICATION
IN
LIBRARIES

ANAND P SRIVASTAVA

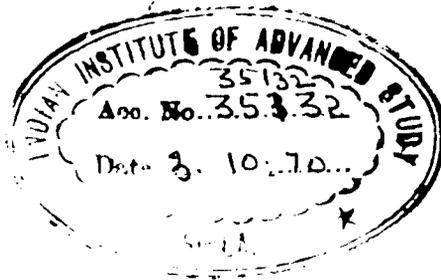
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With a Foreword by :
P.N. KAULA



LAKSHMI BOOK STORE
42 JANPATH MARKET
NEW DELHI-1.

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025.4
Sr 38 T



Published by :

PREM SAGAR
for Sagar Publications
Prop. Lakshmi Book Store,
42 Janpath Market,
NEW DELHI-1.



Library

IAS, Shimla

025 4 Sr 38 T



00035132

Printed by :

A.N. SIKKA
Prop. Sikksons Press,
Karol Bagh,
NEW DELHI-5.

TO

MELVIL DEWEY

THE FIRST GREAT EXPOUNDER

OF

THE THEORY OF KNOWLEDGE CLASSIFICATION

✓



FOREWORD

In the last thirty years, no other branch of library science has created completely new dimensions and new thought, and received so much attention as library classification. It is a well known fact that these developments and inventions have been the result of the contributions of Dr. S R Ranganathan who besides being a renowned classificationist, a grammarian and the creator of original and scientific ideas in several branches of library science, has been the Rapporteur-General of the FID/CA Committee on General Theory of classification of the International Federation for Documentation for a decade. His writings and those of others including W C Berwick Sayers, B C Vickery, B I Palmer, A J Wells, D J Foskett, and J Mills have made the study of this subject very exhaustive and scientific. A student has therefore to probe into the various published documents in order to understand the subject as it exists today.

Shri AP Srivastava has the rich experience of teaching this subject to the Diploma and Degree students at the Vikram, Delhi and Rajasthan Universities for the past several years. Thus he is competent in making an analysis of this branch of library science for the beginners of the subject. He has fulfilled this need to a large extent by bringing out this book.

I am sure that this publication would be useful to the students of library science for whose benefit the book has been written.

19 June, 1964

P.N. KAULA

*Librarian and Head of the Department
of Library Science,
Banaras Hindu University.*

The year 1950 found me looking for a job. Librarianship provided me a berth. Four years later I joined the University of Delhi to undergo necessary training in librarianship. This brought me in contact with Professor S Das Gupta from whom I learnt a great deal about librarianship in general and Classification in particular. I was struck beyond words by the vastness of the subject of classification. In September, 1954, I met another luminary of library science in the person of Padmashri Dr S R Ranganathan—the trail blazer and creator of new ideas. This giant of library science made me feel quite at ease in his classes as well as in the tutorials and thus, instead of feeling frightened by the subject, I began to feel at home with it.

From my experience of teaching classification to library science students in Vikram University and later on teaching this subject to the Diploma and Master's degree students in the University of Delhi, and now while doing the same in the University of Rajasthan, I feel convinced that the feelings of my students, about classification, are not different from the feelings which I myself had as a student of library science. To help students understand the subject I have made use of a simple language and a good deal of diagrams, which I consider necessary in making the subject understandable. The book seeks to achieve this object by serving not only the students undergoing professional education but also those, who are already working as librarians without sufficient knowledge of the modern concepts in classification.

I have attempted to deal with the major principles of classification, as they stand today from the point of view of students' librarian. The treatment of the concepts in classification is elementary. To help the students further, a glossary of technical terms (Appendix A) has been added

for consultation in the event of the terms, used in the text, are found less clear.

I shall be grateful for constructive suggestions from friends who may have an occasion to use this book. It will help me in improving the subsequent edition.

In the end, I express my deep gratitude to Dr S R Ranganathan and Professor S Das Gupta from whom I learnt the discipline of classification. I feel thankful to my students who have forced me to clarify the subject for them if I have at all succeeded in it.

I am also grateful to Prof. P.N. Kaula, who kindly agreed to write the Foreword for this book.

I trust the generosity of the readers whom I expect to show tolerance towards this first essay, and that too, in a foreign language.

Ram Navami,

ANAND P SRIVASTAVA

April 20, 1964.

JAIPUR (India)

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Patterns in classification ; Enumerative pattern—features, merits, demerits ; factors which outmode the enumerative pattern ; analytico-synthetic pattern—process, features, merits, demerits.

Postulational approach—definition, types of postulates, stages of application of postulates, merits of postulational approach, the possible demerits.

Common Isolates in classification—types, DC and common isolates.

Systems and specials—appearance of systems in subjects, definition, analysis of systems, notational provision, favoured systems, numbering of systems, and specials.

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PART I

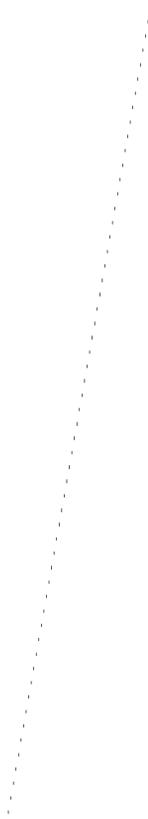
ON

KNOWLEDGE CLASSIFICATION AND DOCUMENTS

“It must be clearly borne in mind, however, that the classification of knowledge should be the basis of the classification of books ; that the latter obeys in general the same laws, follows the same sequence.”

“...A book classification, I cannot repeat too strongly, is a classification of knowledge...”

W C BERWICK SAYERS



KNOWLEDGE, CLASSIFICATION AND DOCUMENTS

What is Knowledge ? The word 'knowledge' means an assured belief or that which is known. In the process of knowing there are two parties, one the knower and the other the knowee. Impact between the two gives birth to knowledge.

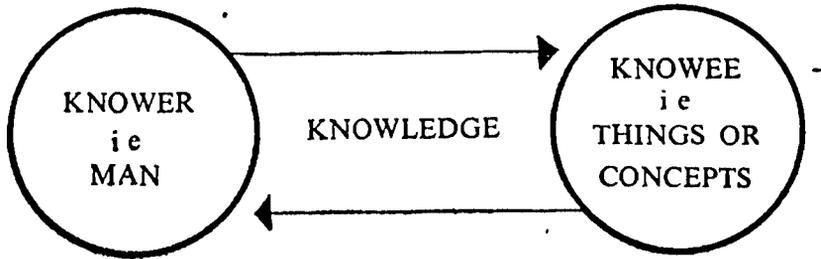
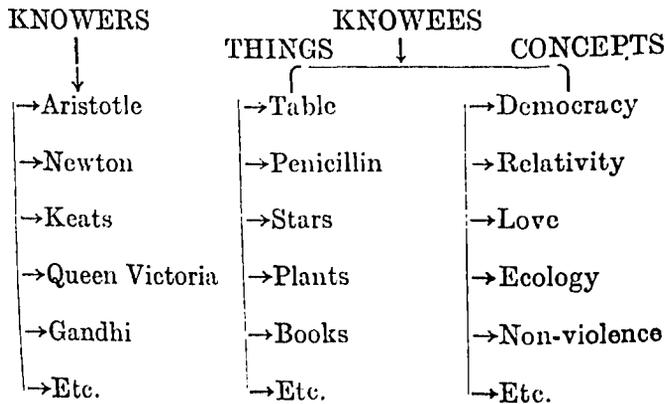


Fig. 1

The knower is always man and the knowee is made up of entities, *i.e.*, things or concepts. When man knows the entities, knowledge is established. As man knew more and more about entities, knowledge grew. In order that the already gathered knowledge be not lost to posterity, it was recorded and stored. Due to three great features of man, *i.e.*, comparatively longer age than most of animals ; living of three generations in a family within society ; and the ability to reason and analyse, he has been able to increase his stock of knowledge. It is difficult to examine if

all that is known by the twentieth century forms a greater part or a tiny little segment of all that could ever be known. However, in view of the vast field yet to be discovered, one can safely say that what we know by today is a very tiny fraction of all the entities known and unknown.

The universe of knowledge is limited due to our limited sources. Before we discuss it, let us have certain examples of 'knowers' and 'knowees'.



Man is the subject and the entities, *i.e.*, things and concepts are the objects in knowledge. Man can achieve knowledge only in certain directions. He can examine nature, the self and the society. He cannot look into any other dimension. Therefore, due to this limitation of man, knowledge is limited to three spheres. They are :

- 1 Man and Nature Natural Sciences (things and concepts therein).
- 2 Man and Self Humanities (things and concepts therein).
- 3 Man and Society Social Sciences (things and concepts therein).

Following is a diagrammatic representation :

UNIVERSE OF KNOWLEDGE

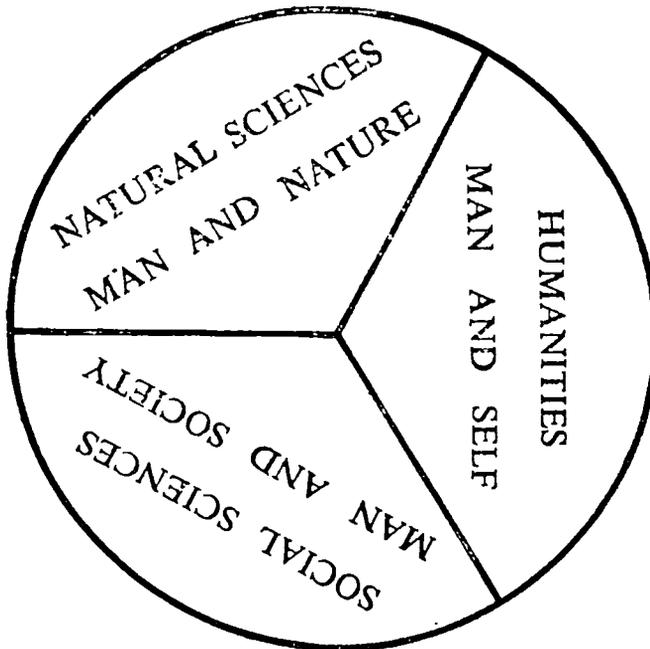


Fig. 2

What is Classification ? Classification is the result of the arrangement of various classes. It means putting similar entities together and separating unlike entities. This is done by examining what makes entities appear similar or unlike. The features or qualities or attributes which the entities possess, may be similar among themselves or may be different from one another. Characteristics are used as the basis for finding out the likeness or unlikeness between entities. Classification is used for grouping of facts or phenomena. It is often taken as a mental grouping, as against physical or actual assortment. We even classify such things which are neither before us nor are they seen by us. Classification is also a grouping for some purpose. The purpose may be general or special ; the latter is mostly for practical use.

Kinds of Classification. According to tradition there are two kinds of classification :

- 1 Natural classification ; and
- 2 Artificial classification.

A natural classification is supposed to be one that exhibits the inherent properties of things classified. It depends on homology, the likeness that resides in the structure and function of the entities classified. Artificial classification is based on analogy, where things are classified by their external likeness and apparent purpose like colour, shape, etc. In addition to above there are many other points of difference between the so-called Natural and Artificial classifications.

Possible Features of the Two Kinds of Classification

<i>Natural</i>	<i>Artificial</i>
1 It is classification according to important and numerous points of similarity.	1 It is classification according to only some unimportant or less important points of resemblance.
2 It is grouping of things according to nature's plan and order.	2 It is grouping of things according to the purpose of the individual concerned.
3 It is more or less objective classification.	3 It is more or less subjective classification.
4 It is classification for general purposes.	4 It is classification for specific purposes.

An attempt to divide classification into natural and artificial with the above points of difference is not a sound proposition. It is difficult to find out as to what points are important and what points are unimportant. It may also not be possible to evaluate as to how many points of similarity will be known as numerous and how

many less than numerous. All classification is made by man and none by nature, and at the same time all classification is natural because however superficial the points of resemblance may be, it actually exists in the entities concerned. It is also not possible to put the classes under two heads because they shall always be mutually inclusive. The list of natural classes, if at all it exists, is not fixed and nor is it unalterable. In the course of evolution a particular class may undergo metamorphosis.

The existence of Natural and Artificial classification may be valid from the point of view of taxonomy. But even this is doubtful now. As far as classification of knowledge is concerned there are no such kinds.

Bliss¹ rightly mentions, "There are indeed two kinds of classification, on the one hand logical, natural and scientific, on the other hand the practical, the arbitrary, the purposive ; but for library classification we should join these two hands ; the two purposes should be combined."

Basis of Classification. There are two important views on the basis of classification. One view is that classification is based on 'Type'. The second view is that it is based on 'Definition'. 'Type' is the representative member of a class possessing the characteristics dominantly. But classification by 'Type' presupposes knowledge of classification itself, because a type is found only by the knowledge of the general attributes of a class. Secondly, classification by 'Type' refers only to popular classification based on general resemblance and not on the essential points of similarity. However, classification by 'Type' is necessary in many cases and particularly in classifying marginal entities where specific points of similarity are often not available.

According to J. S. Mill, classification is based on 'Definition' which states the essential attributes or features of a class. The classifier is supposed to find out common and essential characters of objects and then he should

¹ Bliss (H E) : *Organisation of Knowledge in Libraries*, p. 36.

classify according to those characters. It is presumed that scientific classification is always based on 'Definition'. Since classification by 'Type' is called general classification, the classification by 'Definition' may be called specific classification.

There is yet another basis of classification known as classification by series. This is applicable when different classes of entities possess a particular quality in common but in varying degrees. This means arrangement of classes of entities into a series, according to the varying degrees in which these classes possess a particular quality. This method also presupposes a prior classification of objects into various classes because it is a classification of classes of entities and not of entities themselves.

Classification and Division. Logical attempts have been made to distinguish between classification and division :

(i) Classification consists in grouping individual items into classes ; or in grouping classes into higher classes. Division is more or less a reverse process. It consists of dividing classes into sub-classes and sub-classes into further sub-classes and so on.

(ii) In classification we proceed from less general to more general or from minor extension to greater extension of classes. In division, we proceed from more general to less general or from greater extension to smaller extension. Therefore, on the basis of above, classification is inductive and division is deductive.

Fundamentally, however, the two processes of division and classification are the same. In both we associate things that are alike and separate things that are unlike. They differ only if examined from different points of view. But in case of classification of knowledge for documents it is absolutely essential that both are considered one where division is a tool in the process of classifying.

According to Ranganathan, division is putting entities into many groups on the basis of some characteristics ;

and classification is division *plus* ranking the groups and arranging the groups in a definite sequence.

What are the Documents ? Documents are records of work on paper or on other materials. Ranganathan² prescribes that they should be fit for physical handling, transport across space and preservation through time. A document may be a manuscript, printed, typed or any other means of communication including sound-recording, photographic production, etc.

There are various kinds of documents. They may be books, periodicals, maps, sound-records, micro-films, etc. But books are the most common variety among documents in many libraries. Comparatively speaking, books cover macro-thought dealing with broader areas of knowledge. But due to modern trends of intense specialisation and inter-relation between various classes, a good number of books also cover less extensive knowledge dealing with smaller areas.

The number of periodicals has increased tremendously and now runs into six digits. For modern research, periodical literature is more important than books. In research libraries indexing or classification of articles in periodicals is an important requirement. In a number of libraries documents of other kinds are also available in good number.

A general feature of documents is that on a particular subject, *i.e.*, division of knowledge, there may be a number of documents of various kinds. For example, on a topic like 'Indian Social Customs' there may be as many as fifteen or more books by different authors and forty or more articles by several persons published in periodicals. Like this, there may be numerous other kinds of documents on this subject.

What is Classification of Knowledge for Documents ?
After defining knowledge, classification, and documents,

² Ranganathan (S R) : Prolegomena to Library Classification, p. 344.

each separately, let us understand the implication of the combination of these terms and the specific meanings that they convey. Classification of knowledge in documents is a process of grouping documents containing like divisions of knowledge and separating documents dealing with unlike divisions of knowledge. It is popularly known as subject classification of books in libraries. Library classification is another term assigned to it.

Subject Approach. There are many approaches which readers make in locating their documents and there are various ways in which documents are arranged in libraries. But subject approach in location of documents and subject basis for the classification of documents are the most popular and convenient methods. Miss Kelley, Bliss, Sayers, Ranganathan and many others have advocated it. According to Bliss³, the phrase 'subject approach to books' was originally used by Miss Grace Osgood Kelley. The five laws expounded by Ranganathan⁴ establish that :

"(1) The most popular approach to books by readers is subject-approach ; hence (2) the subject matter of knowledge embodied in them should form the primary basis for the classification of books ; and (3) the more minute the classification the more helpful it is in the fulfilment of laws of library science."

Palmer and Wells⁵ feel that in the special librarian's experience subject approach is most common. When we have to deal with the periodical articles in documentation, the only efficient possible approach in their demand and supply is the subject approach.

There shall always be a few readers approaching documents through the names of authors or the titles of books

3 Bliss (H E) : The Organisation of Knowledge in Libraries, 2 ed., p. XII.

4 Ranganathan (S R) : Prolegomena to Library Classification, 2 ed., p. 99.

5 Palmer and Wells : Fundamentals of Library Classification, p. 19.

etc. To satisfy approaches of this type, the library catalogue is always at service. The basic fact that knowledge is embodied in documents and that there are several subjects in the universe of knowledge, the individualisation of documents and grouping of like documents is bound to depend on subject basis. More so, because knowledge gets broken up into various subjects and it is on these subjects that documents are written. To think of any other basis for the classification of documents may be of academic interest, but the actual classification of documents on such a basis is bound to prove a failure. When such a statement is made, formation of different collections to suit specific needs is not ruled out. Take for example, the different collections that a library maintains. While putting the documents in the different collections, the subject is not the basis. But while classifying the documents within a particular sequence, one uses subject as basis of classification.

Mills⁶ has worked out the possible considerations that may influence the library to have separate sequences. Some of them are :

- 1 Age and grade of the reader.
- 2 Books for loan and questionable books or those for reference.
- 3 Current and reserve stock.
- 4 Size of documents.
- 5 Other physical considerations, *i.e.*, films or gramophone records, etc.
- 6 Factual and imaginative literature.
- 7 Language of the documents.
- 8 Documents of temporary significance.
- 9 Value of documents like rare materials, etc.
- 10 Form of presentation like bound periodicals, etc.

6 Mills (J) : A Modern Outline of Library Classification, Indian ed., p. 3.

- 11 Date of printing, etc.
- 12 Text-books.
- 13 Documents peculiar to different sexes.
- 14 Documents for abnormal readers, such as the blind.

It should be noted that in order to have an efficient method of location and replacement, in each of the above collections, subject basis will have to be adopted in classifying the documents in each collection.

What is a Specific Subject ? A specific subject is that piece of knowledge which is dealt with in a particular document. This piece of knowledge may be a wide area or a narrow area within the universe of knowledge. Ranganathan⁷ has defined it in the following words :

“Specific subject of a book is that division of knowledge whose extension and intension are equal to those of its thought content.”

Palmer and Wells⁸ give the following definition :

“The specific subject of a book is that division of knowledge which exactly comprehends all the major factors that go in its (thought-contents) making.”

The specific subject of a document may be just a broad main class of knowledge, the further divisions, one or more in relation, of a main class, or a subject running into a number of a main classes with their sub-divisions. The specific subject of a book will, therefore, fall under the following categories :

7 Ranganathan (S R) : Elements of Library Classification, 3 ed., p. 12.

8 Palmer and Wells : Fundamentals of Library Classification, p. 20.

Categories of Specific Subject	Example
1 Simple specific subject	1 Textbook of psychology.
2 Compound specific subject	2 Feeling in abnormal psychology.
3 Complex specific subject	3 Feeling in abnormal psychology in relation to social customs.

The first title deals with the broad main class Psychology. The second title covers two divisions of the main class Psychology, *viz.*, Abnormal entity and Feeling. The third title belongs to two main classes, Psychology and Sociology. Under the class Psychology, it deals with its divisions—abnormal entities and feeling, which have been examined in relation to social customs, which is a division of the main class Sociology.

The specific subject of a document is determined by examining the thought-contents of the document and is then translated into numbers according to a scheme of classification.

Need for Classification. Documents need classification so that the preferred sequence may be maintained in a library. If documents are not classified disorder will prevail and confusion will arise when one finds an unrelated mass of books. Of this Sayers⁹ says, "It is to bring system out of confusion of things that classification has been devised." Sayers is of the opinion, "As classification is applied in libraries, it brings like books together; it saves time in finding them; it reveals the weakness or strength of the collection; it makes systematic revision of and addition to the stock possible. In fact, it is the foundation of all successful modern library work." Bliss supports classification when he

⁹ Sayers (W C) : An Introduction to Library Classification, 9 ed., p. 2.

says that it is an essential economy to readers and to librarians.

The basic purpose of classification is to individualise each subject within its relevant class. This individualisation is only possible if each subject is given its own special name or number and that no other subject shares this number. For individualising a subject in this manner, classification must be provided with an exhaustive scheme of notation. To Ranganathan the first step in the classification of a document is the translation of its specific subject into an artificial language of ordinal numbers (notation). The need for this translation is due to the following features¹⁰ :

1 When a reader asks for a book (document) which is in a library, it must be located immediately, even though the library may have miles of shelves of books.

2 When a book (document) is returned to a library, its correct place on the shelves must be easily determinable so that it can be replaced (and be ready) for the next user.

3 When a new book is added to a library it must find its proper (helpful) place among the other books on the same subjects.

4 When the first book on a new subject arrives in a library, it must find a place among the books on such other already existing subjects which are related to it, and in the degree of its relation to them.

The need for the classification of documents and the subsequent assignment of call numbers to them is as important as the name-giving ceremony to a newly born child in a family where a specific name is given to the child. Whenever and wherever this person is required in the society during his life time he is called by his individual name. If necessary, a word like 'primus' or 'secondus',

10 Ranganathan (S R) : Elements of Library Classification, 3 ed., p. 14.

etc., is added to the name, if there are two or more persons of the same name. In the same manner, each of the two or more books on a specific subject should be given a certain additional number—called book number—for the individualisation of the one from the rest.

Another reason why classification of documents is needed, is from the point of view of library education. All those who enter this profession possess training only in a few areas of knowledge, while as librarians they are supposed to deal with the documents in all branches of knowledge. This requires that a student-librarian should be introduced to the structure and development of knowledge in various areas. A possible course for achieving this end is through teaching of classification. Experience shows that by the time the students complete their library education they become familiar with the structure of all the main classes of knowledge. If they continue to learn in this direction throughout their career, they will be more than a jack of all subjects.

Librarians' Interest in the Field of Knowledge. Study of the field of knowledge is of importance to many subject experts. Some important subjects which bring the field of knowledge within their discipline are the following :

- 1 Epistemology.
- 2 Psychology of knowledge.
- 3 Sociology of knowledge.
- 4 Classification of knowledge.

Epistemology is the theory of knowledge. It is concerned with topics like nature of knowledge, sources of knowledge, limits of knowledge, validity of knowledge, etc. Psychology of knowledge deals with the mental activity of knowing. It is a scientist's interest. Here emphasis is on subjective aspect of knowledge. A psychologist would like to know circumstances under which a mind feels in a particular way. If people say that the world is going to end today because eight stars are in one house, the psycho-

logist would be interested in knowing the circumstances under which this belief originated. Whether the world is actually going to end tonight or not is not his concern.

It is during the last forty years or so that a new subject, sociology of knowledge, has developed. It is a subject of the widest possible scope and covers the entire gamut of cultural products. Its thesis is that knowledge is existentially conditioned. The scope of this subject includes the analysis of different conflicting views in a society at a time, laws of the climate of opinion and to find out the existential basis of truth, social illusion and superstition, etc. This subject also investigates where the existential bases of mental productions are located in society. It also investigates cultural bases for values and ethics in a society and the reason why knowledge at all develops in a particular society while in another it rests on primitive pattern.

Our concern here is greater in the librarians' interest in knowledge as a field of study. A librarian is concerned with knowledge because he wants to classify documents containing different or all known units of knowledge. The scope of his interest is :

- 1 To put in a helpful sequence the documents dealing with like and unlike units of knowledge ;
- 2 To put documents of smaller units of knowledge within the bigger unit of knowledge and also to see that bigger units of knowledge are placed before the smaller units ;
- 3 To put the coordinate units of knowledge in an array of classes and subordinate units in a chain manner ;
- 4 To indicate various types of relations between the units of knowledge which a particular traditional Basic Class may have ;
- 5 To indicate various types of relations between more than one Basic Class ;

6 To indicate the relation between special units of knowledge and the common units (isolates) found in knowledge ;

7 To individualise various documents dealing with the same subject and also to indicate the physical features of documents which embody the units of knowledge ;

8 To devise an efficient scheme of artificial language of ordinal numbers, which will arrange the documents in a line and in a helpful manner ; and

9 To solve other problems, which arise from time to time in dealing with the above points.

In order to perform his duty successfully, the librarian must adopt a scientific method for handling the above points of his interest in respect of knowledge. The first thing that should be understood is the structure of knowledge which is multi-dimensional and whose development is dynamic. Ranganathan has distinguished certain processes by which the classes of knowledge are formed. These processes are :

- 1 Dissection ;
- 2 Denudation ;
- 3 Lamination ; and
- 4 Loose-semblage.

Dissection is the simplest method of forming classes. The sub-divisions that we get by dissection are mutually exclusive. When the universe of plants is dissected we get two coordinate classes, *i.e.*, Flowering plants and Non-flowering plants. These are the classes in an array.

UNIVERSE OF PLANTS

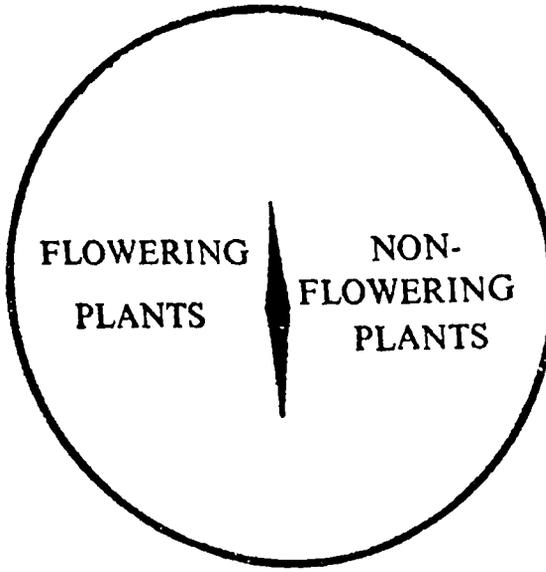


Fig. 3

Denudation is progressive decrease in the extension of a class. Here one class is further sub-divided. The classes that we get are subordinate to one another. If we take the class Mathematics, one of its further divisions is Arithmetic. When we divide arithmetic, one of its further sub-divisions is lower arithmetic, and so on. The sequence of such classes are said to form a chain, as will be evident from the following diagram :

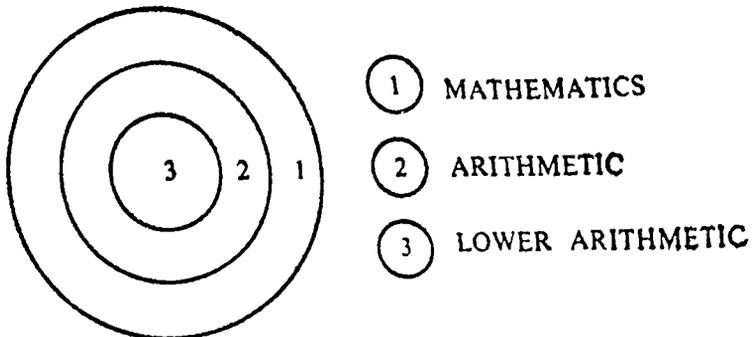


Fig. 4

Lamination is the process of sub-dividing a class by indicating one of its divisions with it. This is known as attaching an isolate or a facet (or a unit) to the class. This happens in case of compound specific subjects. Suppose we divide the class Medicine. Its division will run in more than

UNIVERSE OF MEDICINE

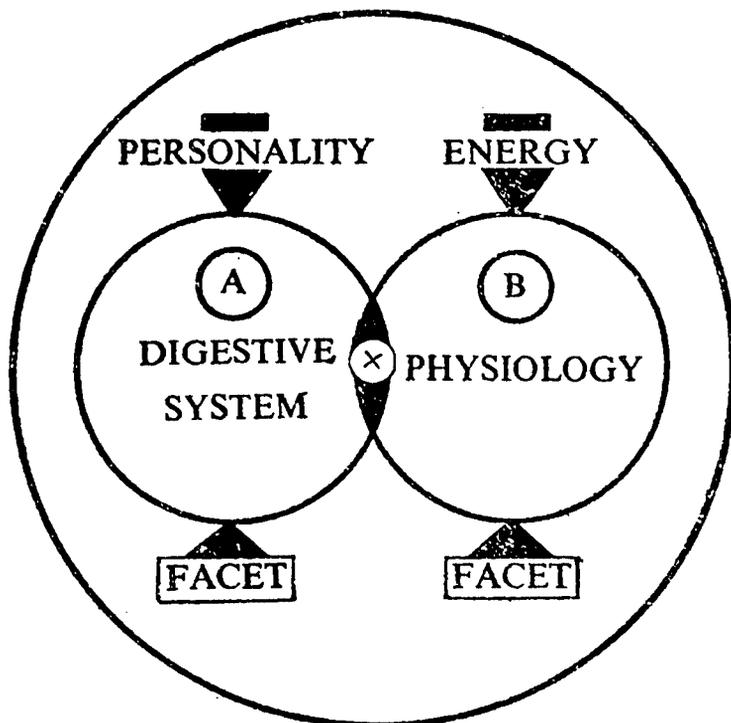


Fig. 5

one direction. On the basis of each of different categories we get a number of isolates. Digestive system belongs to one category and Physiology to another. If we have to indicate one and only one of such divisions, say Digestive System in medicine or Physiology in medicine, it is merely a process of denudation. On the other hand, it is the process of lamination when both of these isolates are to be taken together to make up a specific subject. Suppose we have a document dealing with Physiology of Digestive System. The two isolates are the sub-divisions of medicine under different categories and the specific subject deals simul-

taneously with both of them—each restricted to within the area of the other. This is marked as X in the diagram. Ranganathan describes it as putting layer upon layer. The concept of lamination has shown a new way. This is called Facet Analysis of a subject. Modern developments in classification are dependent on such a faceted classification.

Loose-assemblage reveals another mode of formation and exposition of knowledge. This phenomenon is due to overlapping between altogether different classes. When we find that either due to the trend of specialisation or due to the depth of a subject, the specific subject of a document deals with one class in its relation to another class, it is said to be a case of loose-assemblage.

About eight years ago, K D Puranik investigated the mode of formation of knowledge and its exposition in documents. He found that in periodical literature loose-assemblage dominates the formation and exposition of knowledge. One can safely say that in the case of the books of today, lamination dominates the formation and exposition of knowledge.

Characteristics. All entities—things or concepts—possess certain attributes. To think of an entity not possessing an attribute is an impossibility. There are an enormous number of attributes that an entity may have. When we try to group like entities together, their attributes are examined. As there are a number of attributes which the entities may present, it may not be possible or even necessary to consider all of them. The result is that only a few attributes are selected for the purpose of classification of entities. These selected attributes may be termed as characteristics used for classification of entities. Suppose an entity has a total number of ten attributes, it is possible that only one attribute, which will be known as characteristic, is picked up for use. When there are ten attributes and only one is to be selected as a characteristic for the purpose of classification, it is obvious that all the ten attributes will offer themselves for selection and use as a characteristic in classification. So, in a way, there is a competition between the attributes and

all of them become candidates for being selected as a characteristic for classification. In this situation certain tests are applied and those attributes which pass the tests are declared successful and are thus selected for use as characteristics in the process of division. Ranganathan¹¹ has worked out seven tests (canons) which an attribute should pass for becoming a characteristic. These are :

- 1 Canon of Differentiation.
- 2 Canon of Concomitance.
- 3 Canon of Relevance.
- 4 Canon of Ascertainability.
- 5 Canon of Permanence.
- 6 Canon of Relevant Sequence.
- 7 Canon of Consistency.

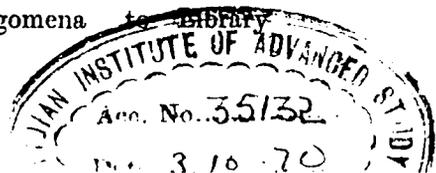
These canons select the needed characteristics out of the universe of attributes. Differentiation means that a characteristic should be able to divide the entities at least into two classes. Suppose in a class-room there are a number of persons excluding the teacher. One of the attributes of these persons is that they are students. Suppose this attribute is selected as a characteristic. The result shall be that when we apply the characteristic, *i.e.*, student, the class will not get divided, because all of them are students. But suppose, we select one of the following attributes :

sex, ability, mode of admission,

the class will be divided into male and female ; intelligent and dull ; deputed and non-deputed, respectively. This canon demands one of the essential things in classification, *i.e.*, the provision for further sub-division of classes through characteristics.

Canon of Concomitance demands that two or more characteristics which will give the same set of groups on division should not be adopted. Relevance emphasises that the characteristics should be relevant to the purpose involved in the process of division. Ascertainability pres-

11 Ranganathan (S R) : Prolegomena to Library Classification, 2 ed., p. 54.



cribes that whatever we select as characteristic, it should be able to depict itself in the course of division, where it is applied. Canon of Permanence rules out temporary phenomena or attributes for selection as characteristics because the resulting division will not be stable.

Relevant sequence fixes the sequence of application of the selected characteristics, when they are more than one. Suppose we have to classify the universe of literature. There are four characteristics that would be applicable in its division. They are :

Author, form, work and language.

The question arises in what sequence these four characteristics should be employed.

Knowing the purpose of classification and the pattern of the class literature a helpful sequence is as follows :

Sequence of Characteristics

1	2	3	4
Language	Form	Author	Work

This is the relevant sequence to the purpose in demand.

Consistency is a general rule. It demands that in a particular set of circumstances the same sequence of characteristics should be adopted.

All these seven canons for characteristics must be observed to have a real and helpful division.

Concept of Helpful Sequence. The very purpose of classification is to obtain a helpful sequence. As a first step in this direction, like things are put together while unlike things are separated. The need in classification of knowledge is to maintain a helpful sequence between the various divisions of knowledge. A scheme of classification for documents will fail in its purpose if a helpful sequence is not maintained between the various units of knowledge embodied in them. But in spite of this, one occasionally hears the statement that structure of knowledge is so complicated that the concept of a helpful sequence of its classes is an

impossibility. The arguments that are put forward in favour of this are that what is helpful to one person is not helpful to another ; there are no fool-proof standards or principles through which a helpful sequence could be maintained ; and that thoughts embodied in documents are often multiple classes as against one single class, and that the mutual relations are so complicated that they could not be recognised or individualised. The concept of helpful sequence may thus be resisted in different ways according to the will of each individual librarian. A solution to this difference of opinion is to depend upon the concept of 'general will'. The 'general will' is that a helpful sequence is needed and it is also possible.

Bliss¹² advocated the need for classification for the convenience of all types of libraries and he says that this convenience depends on two principles of utmost importance :

- 1 Subordination of special (or specific) to relevant general (or generic) classes ; and
- 2 Collocation of closely related classes, subordinate and coordinate.

Bliss has concluded that maximal efficiency is dependent on these two principles. Out of these two principles, collocation is more general than subordination of special, because subordination of special to general is one of the ways of collocation.

In the works of Sayers we find two terms extension and intension. But at the same time he uses¹³ a terminology which shows the influence of Bliss. "A general scheme is, therefore, a great number of classificatory lines showing the right subordination and correct coordination of subjects, or classes, in each, and finally the right placing of each classification in the entire scheme. Together they make whole of the knowledge ; they exhaust the

12 Bliss (H E) : *Organisation of Knowledge in Libraries*, 1939, p. 31.

13 Sayers (W C B) : *Introduction to Library Classification*, 9 ed., p. 32.

universe—in outline of course. They are placed (collocated) in the order the classificationist thought most convenient for his users.”

The above quoted sentences are a synthesis of the influence of Bliss and that of Ranganathan on Sayers' analysis. This is peculiar to the style of Sayers, who had an open mind. For a comprehensive account of the concept of Helpful Sequence, one had to wait for Ranganathan's analysis of the problem. In 1944 his *Elements* was published with a chapter on Helpful Sequence. As the placement of the divisions of knowledge is either in coordinate groups of classes, *i.e.*, arrays, or in sub-ordinate manner, *i.e.*, chains; and because in case of chains the principle of greater extension before the lesser extension is always valid for helpful sequence; Ranganathan examined the principles mostly for finding a helpful sequence between the coordinate classes, *i.e.*, arrays. Ranganathan¹⁴ has given the following principles :

- 1 Principle of decreasing extension.
- 2 Principle of increasing concreteness.
- 3 Principle of later in evolution.
- 4 Principle of later in time.
- 5 Principle of spatial contiguity.
- 6 Principle of canonical sequence.
- 7 Principle of consistent sequence.
- 8 Principle of increasing complexity.

To this list of principles must be added the principle of alphabetical sequence, also expounded by Ranganathan, to meet the situation where the above principles are not needed. But this is not all. A number of situations arise in the process of classification where these principles are found ineffective. Suppose a set of documents deals with certain topics on the different stages of education and also certain problems and activities under education and

¹⁴ Ranganathan (S R) : *Elements of Library Classification*, 3 ed., p. 30.

there is also interrelation between these sets; for example :

<i>Group 1</i>	<i>Group 2</i>	<i>Group 3</i>
1 University Education	3 Teaching technique	5 Teaching technique in University Education
2 Secondary Schools	4 Curriculum	6 Curriculum in University Education
		7 Curriculum in Secondary Schools
		8 Teaching technique in Secondary Schools

What is the most helpful sequence between these eight topics ? The principle of increasing concreteness will put curriculum and teaching technique before Secondary School and University Education. Should the topics under group 3 go with group 2 or group 1 ? Here none of the principles mentioned before will help. But if we examine the nature and association of the topics in group 3, it will not be difficult to decide that their approach is often, rather very often, through the topics under group 1. So they can be collocated with the respective titles in group 1. The helpful sequence will be as follows :

- 1 Curriculum
- 2 Teaching technique
- 3 Secondary Schools
- 4 Curriculum in Secondary Schools
- 5 Teaching technique in Secondary Schools
- 6 University Education
- 7 Curriculum in University Education
- 8 Teaching technique in University Education

This principle is that of commonsense and requires the understanding of the structure, development and organisation of the main divisions of knowledge. Here we may

conclude that the combination of abstract and concrete should go with the concrete classes.

Palmer and Wells¹⁵ have defined helpful sequence in the following manner :

“Helpful order (sequence) can be defined as that which displays subjects in such a way that a person approaching a group of subjects at any point is led by the order (sequence) itself to the specific subject he needs.”

They feel that such a sequence can be established with the principle of decreasing extension. Influence of Bliss on these authors makes them suggest that the following sequences be maintained :

- 1 The general treated generally.
- 2 The general treated specially.
- 3 The special treated generally.
- 4 The special treated specially.

This approach by Palmer and Wells is valid in case of classes in a chain and not in case of coordinate classes in an array.

All this discussion on helpful sequence will be incomplete, unless the fundamental principle of APUPA pattern enunciated by Ranganathan is explained. There are three types of records. A totally or intimately relevant record is known as Umbral Record. A partially irrelevant (but in some manner related to the Umbral) record is known as Penumbral Record. A totally irrelevant (in no manner related to the Umbral) is known as Alien Record. The helpful sequence in which they can be arranged is : Alien—Penumbral – Umbral – Penumbral —Alien. This sequence puts the most relevant records in the centre. The records which are connected with it are placed before and after it ; and those which are totally disconnected records are put at a distance from the

¹⁵ Palmer and Wells : Fundamentals of Library Classification, p. 24.

umbral. The arrangement of documents in a library should everywhere be on APUPA pattern.

The implications of helpful sequence in a scheme of knowledge classification are in five directions :

- 1 Sequence between the traditional main classes ;
- 2 Sequence between the various facets of a main class ;
- 3 Sequence between the isolates of a facet which fall in an array ;
- 4 Sequence between the isolates of a facet which fall in a chain ; and
- 5 Sequence between the common and special isolates.

For (1) the general concept of Apupa pattern helps ; in the case of (2) the principle of increasing concreteness is employed ; in the case of (3) the isolates are arranged with the help of the principles of evolution, time, spatial contiguity, canonical sequence and increasing complexity etc.; in the case of (4) the principle of decreasing extension is held valid for arrangement ; and in the case of (5) the common isolates are sorted out—as those which demand placement before (anteriorising) and those which are better placed after (posteriorising) the special isolates.

With the help of the above principles it is possible for a scheme of classification to provide helpful sequence in the organisation of documents. The principles discussed above are logical and can satisfy all approaches. While maintaining logical touch they do not get involved in the art or science of logic, which a few of us consider out of bounds for knowledge classification. Really speaking, classification without logic is confusion leading to disorder, the question of difficulties and subtleties of logic, raised by certain authors will have to be faced by all those who want to use logic as a tool to remain reasonable.

Filiatory Arrangement. Filiatory arrangement is the placement of all the entities of a universe in a definite sequence in one line according to the degree of their

mutual affinities. This definite sequence is achieved after complete sorting out (assortment) of the divisions of classes under consideration. The feature of this arrangement is ranking according to the degree of relation, *i.e.*, the sub-divisions of a class having first rank relation with a subject, will come first. The second place will go to the subjects of second rank relation and their divisions. Then will come the third related subject with its divisions and so on. Let us take an example. In a circle there are a number of subjects, which are related to one another in various degrees, just as persons in a family are related.

UNIVERSE OF PHYSICS

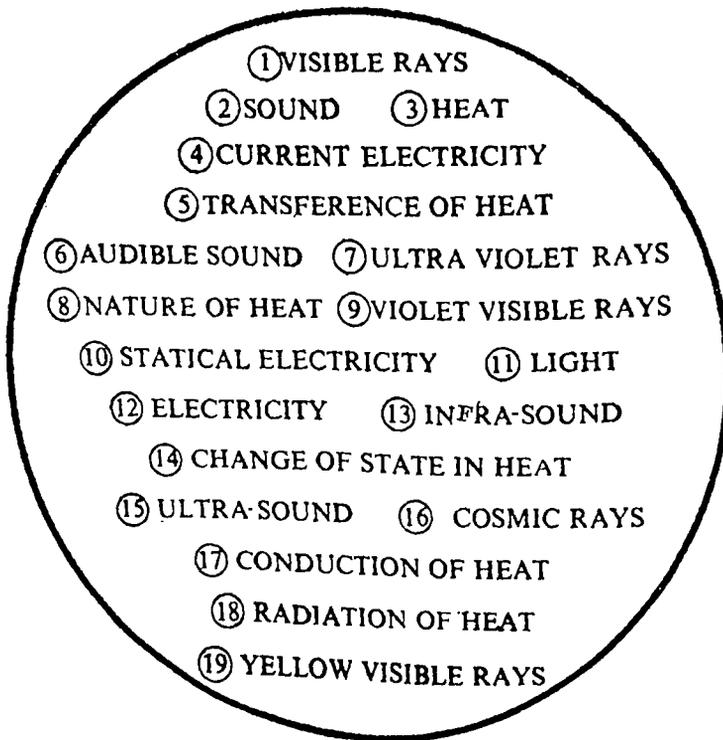
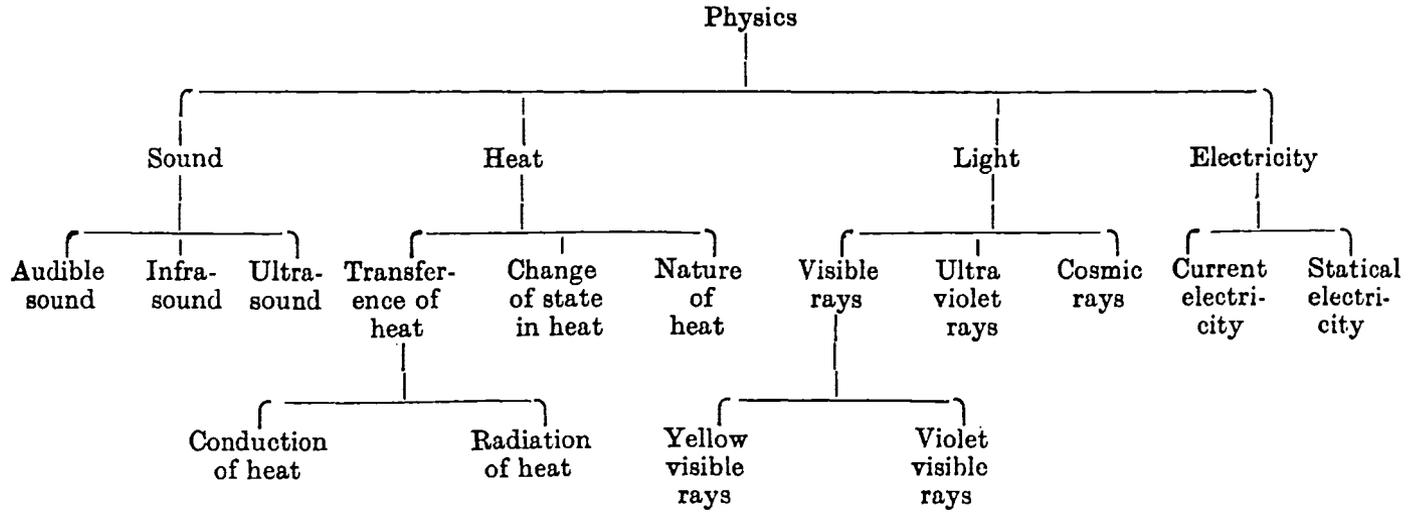


Fig. 6

The above mentioned 19 classes are from the main class Physics. Their arrangement in a tabular form will be as follows :



It may be noted that the classes arranged in the above table are in a helpful sequence. As our purpose is to arrange these classes in a line, the filiatory arrangement will be as follows :

Physics; sound, audible sound, infra sound; heat, transference of heat, conduction of heat, radiation of heat, change of state in heat, nature of heat; light, visible rays, yellow visible rays, violet visible rays, ultra sound rays, cosmic rays; electricity, current electricity, and statical electricity.

The above arrangement resembles the arrangement in a family tree. Physics is like the father (immediate universe) of sound, heat, light and electricity, which are like four brothers (classes in an array). Sound, the first son of Physics, has his own children. Heat the second son has his three sons. The first son of Heat, *i.e.*, Transference has his own children named Conduction and Radiation. Therefore, soon after Transference of Heat (which comes after Heat) will come his children — Conduction and Radiation. They are the grand-sons of Heat and great-grand-sons of Physics. After them will come Change of State in Heat and Nature of Heat. Then comes Light, the third son of Physics. It is followed by visible rays and their children yellow and violet. Then comes ultra sound rays and cosmic rays. The fourth son, *i.e.*, Electricity and his family comprising his two sons, current and statical, come in the end. This is the concept of 'Filiatory arrangement' in a line which, to repeat, is the result of complete assortment of the entities in a universe according to varying degrees of nearness between them.

PART II

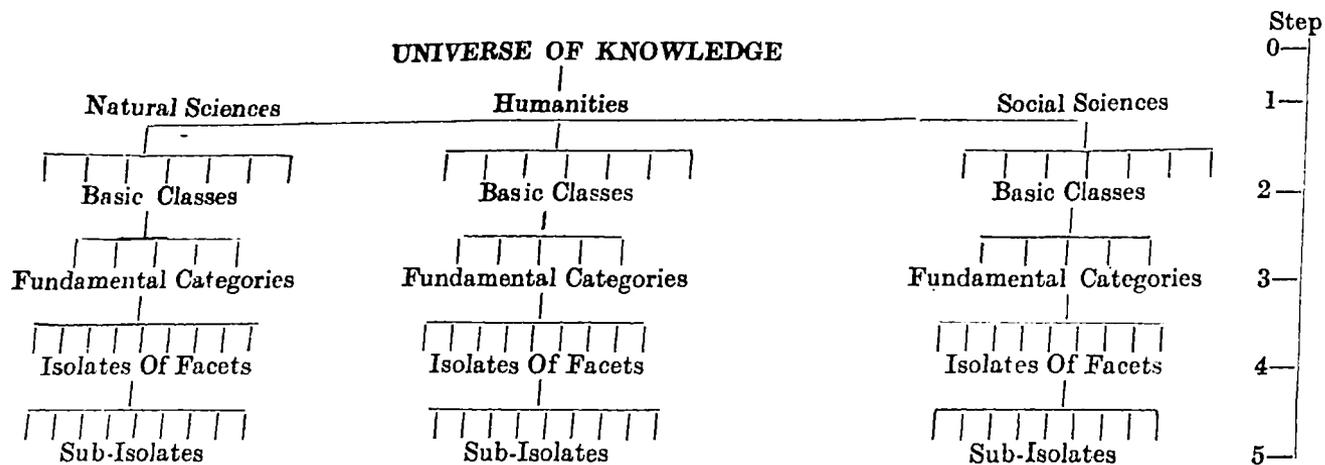
ON

FUNDAMENTAL CATEGORIES, ARRAYS
AND CHAINS

“A scheme of classification for the Universe of Knowledge must provide for...the accommodation of new classes in the scheme without violence to the canons of Filiatory Sequence and Helpful Sequence, and without need to change the already existing class numbers.”

S R RANGANATHAN

CHART SHOWING DIVISION OF KNOWLEDGE



FUNDAMENTALS OF KNOWLEDGE CLASSIFICATION

Structure of Knowledge Classification. The whole universe of knowledge is divided into three areas—Natural Sciences, Humanities and Social Sciences. This is the first step in the process of the division of knowledge. From these three areas, the main classes are derived. Main classes have been established by tradition. They are the areas under which study and research have been conducted in the past. The academicians have contributed sufficient literature on them. They are the organisational units for teaching, particularly in the Universities, all over the world. The specialists and professions exist in each of these classes. For example, Chemists for the main class Chemistry ; Medical profession based on main class Medicine ; Botanists, specialising in main class Botany ; Economists, dealing with the main class Economics, and so on. These main classes separately originated in the past as departments of learning and research by the academicians in different countries and even today they stand valid for that purpose. It is presumed that they will remain valid for some time to come. Further, a Main class is the name by which a broader area of knowledge is referred to by those interested in it.

Main class as a term in classification has been defined in various ways by different authors. Ranganathan has defined main class as “the fairly homogeneous, conventional regions of knowledge, which together form the first order array of classes which are mutually exclusive and totally exhaustive of the field of knowledge”. In *Prolegomena* he mentions :

“Main class : Any class enumerated in the first order array of a scheme of classification of the Universe of Knowledge. This definition is valid only for the scheme concerned.”

This means that the main classes in all the schemes of classification may not be the same. But the classes which appear as the major divisions of the Universe of Knowledge, are the main classes in that scheme. This also means that Main class is not a very precise term. But the determination of correct main classes is a vital point in knowledge classification, because the success of further division with the help of the fundamental categories would rest on the right connotation of each main class under which an effective facet formula can be worked out.

Once the knowledge is organised into a number of main classes, the next step is to mark out for each main class the facets which are likely to be presented by subjects falling within it. Most of the main classes admit of this being done. Recognition of the possible facets of subjects in a main class and relating each such facet to its fundamental category is the third step in the division of the Universe of Knowledge. The concept of fundamental categories will be taken up separately. After the application of the idea of categories to enumerate the facets, the isolates which make up each facet are sorted out and arranged in a helpful sequence. The enumeration of the isolates corresponding to each fundamental category is the fourth step in the process of the division of the Universe of Knowledge. When the need arises, the isolates are further sub-divided into sub-isolates ; and if the need continues, the sub-isolates are further sub-divided. These may be termed fifth or sixth step, as the case may be, in the process of division.

The table given in the beginning shows the various steps in the division of knowledge classification. In this table, we find that at every step a group of co-ordinate isolates arises. They are derived from the isolate of an earlier sequence. These isolates are said to be isolates in an ARRAY. When divisions continue further, the isolates

from the first chain to the last chain are said to be isolates in a CHAIN.

CHART SHOWING
FIVE FUNDAMENTAL CATEGORIES

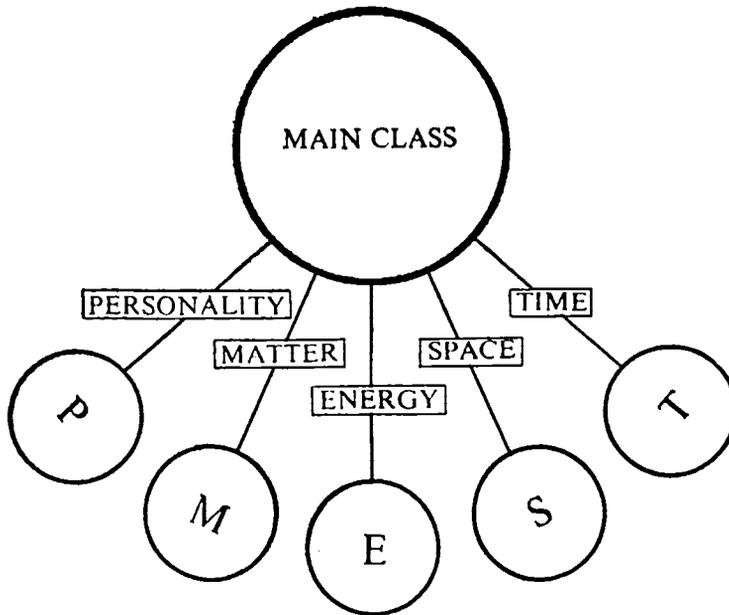


Fig. 7

Note : These are the five fundamental categories into which a subject is divided. We may say that these are the five aspects of a subject. We can also say that these are the five constituents of a subject. The standard term, however, is FUNDAMENTAL CATEGORIES.

So far, the following important concepts have been named here :

- 1 Main classes.
- 2 Facets under a subject.

- 3 Isolates in facets and their sub-isolates.
- 4 Classes in an array.
- 5 Classes in a chain.

The fundamentals of knowledge classification are the principles associated with these concepts and the implications arising therefrom.

Facets of a Main Class :

(i) **Where applicable ?** The term 'facet' is used at a particular stage in the process of the division of the Universe of Knowledge. When we divide the Universe of Knowledge upto the stage of Main classes, facets do not appear. But when we have to divide a main class, the concept of facets appears in the case of some main classes.

(ii) **Purpose.** The purpose of facets is to divide a main class into its possible aspects. As a Main class, contains a number of smaller units of ideas or entities within it, one method of their division is to group all of them only in one line. Suppose, a main class has a total of one hundred entities, according to one method, they can be enumerated as below :

Main Class

1
2
3
4
5
:
:
72
73
:
85
:
93
:
:
:
100

All the hundred entities that arise in a main class, can be arranged in a column. This placement may still be helpful. This type of division of main classes is said to be the arrangement in one direction. It starts from item 1 and goes to the last item. Here decimal fraction notation has not been followed. This method can be named as direct division of the entities of a subject in one column.

(iii) **How applicable ?** Another possible method for the division of a main class is to divide it first into its possible facets. The process can be termed as recognising categories under a class. Thereafter the entities under each sub-group are individualised. This method can be named as indirect individualisation of entities under different aspect-heads (facets), of a subject, in many columns. This concept of facets can be further explained thus : Suppose the main class is Psychology. It will obviously contain certain entities. In the circle below we get a total of only nine entities. They have to be arranged

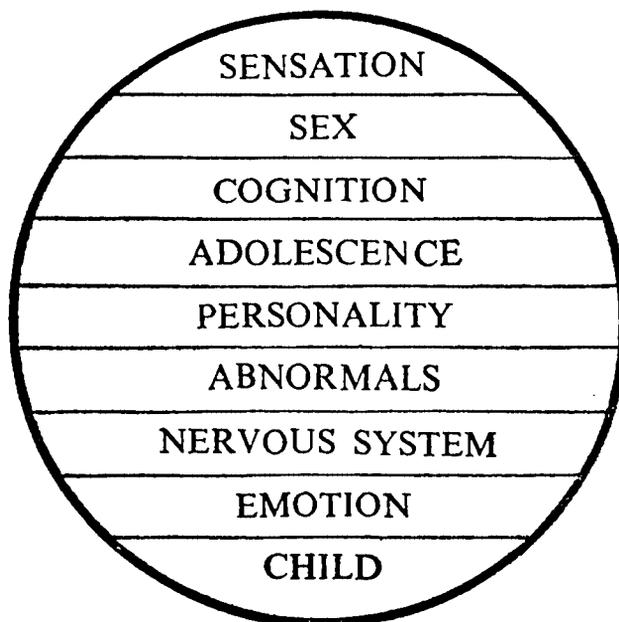


Fig. 8

and individualised. The direct method of their arrangement will be as follows :—

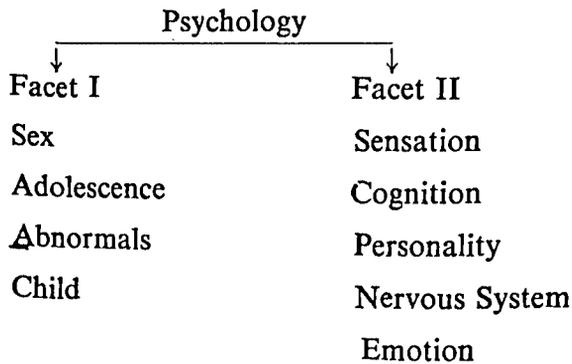
Psychology

- 1 Sensation.
- 2 Sex.

- 3 Cognition.
- 4 Adolescence.
- 5 Personality.
- 6 Abnormals.
- 7 Nervous System.
- 8 Emotion.
- 9 Child.

Note : The sequence may be one mentioned here or any other. As there are nine units, the possible number of sequences will be $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 = 3,62,880$. The notable feature here is that all units have been individualised directly under Psychology.

The following is the method of individualisation through facets. An examination of the nature of the contents of the circle will show that there are two types of facets into which these nine entities can be grouped.



(iv) **Definition.** So, facets are divisions of a main class through which all the entities of a class are first grouped under each possible category and then individualised. The facets of a class are determined with the help of a certain

train of characteristics which are applied to the subject for its division. There are many trains of characteristics each of which divides a subject. A certain number of trains of characteristics will yield an equal number of facets of a class.

But the question of facets is not a simple affair. It is certain that the concept is the best find of the 20th Century for knowledge classification, and it is universally accepted that credit for it goes to Ranganathan. All modern researches in documentation, coding and classification, have been influenced by the concept of facet analysis. Various attempts have been made to define the term. They are as follows :

Metcalf¹. "Facet analysis seems to mean either what has been called subject analysis of particular documents, as a step to their synthetic representation by so called class or code numbers, or it means the analysis of a subject field to discover a basis for its classification, whether enumerative or analytico-synthetic."

Here the author himself is not sure.

Palmer and Wells². ".....facet analysis, which simply means the analysis of a specific subject into the facets produced by the application of different characteristics."

Ranganathan³. "The totality of the isolates formed on the basis of a single train of characteristics is a facet, in the idea and verbal planes. The isolate number belonging to a facet is a facet of the class number, in the notational plane."

1 Metcalfe (J) : Subject Classifying and Indexing of Libraries and Literature, 1959, p. 247.

2 Palmer & Wells—Fundamentals of Library Classification, p. 32.

3 Ranganathan—Prolegomena to Library Classification, p. 170.

Wildback⁴. He considers it as a synonym of 'point of view' according to which a subject can be divided.

Foskett⁵. He believes that facet analysis consists in an analysis of a subject in its entirety into a certain number of facets or categories of things; within each category, the subject headings enumerated all possess the same relationship *vis-a-vis* subject in its entirety.

"Glossary and Subject Index". "A concept of high generality and wide application which can be used to group other concepts."

A comparative examination of the above statements is bound to lead to an advanced treatment of the topic which is not the purpose of this book. Here it will be sufficient if the concept of facets is understood in the following words :

Facets or categories are the sub-major groups of a subject dealing with fundamental aspects into which a main class is divisible. They are derived with the help of different trains of characteristics.

(v) **Facet Analysis**. The entire process of determining the facets of a subject is known as Facet Analysis. Once, while dividing a subject we break it into different facets and mention therein all possible entities. Secondly, when we have to classify a document, we examine the entities it contains and the facets to which these entities belong to in knowledge classification. At once we notice the real value of breaking a subject into its facets and that is, when we find that one isolate is in relation with an isolate of a different facet of the same subject. The relation between one whole of a facet with an isolate of a second facet, an isolate of

4 Wildback—4—Proceedings Dorking Conference, p. 105.

5 Quoted by de Grolier : A Study of General Categories, p. 15.

a still other facet and so on, is commonly found in many documents. When we have to individualise this type of relationship, the concept of Facet Analysis comes to our help. Let us take an example.

There are three documents :

- (a) On flowering plants ;
- (b) On ecology of plants ; and
- (c) On ecology of flowering plants.

These three documents belong to the main class Botany. Document (a) belongs to one facet of the main class based on the family of plant. Document (b) belongs to another facet of the main class based on the problems of study in Botany. These two documents can be classified under two separate facets. But when we take the third document, we find that it deals with the relationship or contact between two units, *i.e.*, ecology and flowering plants. How can we classify this book ? If we put it in either of the categories or facets, it is not a proper classification. The solution to this problem comes from the concept of Facet Analysis which will classify the three documents in the following manner :

	Arrangement Sequence
(a) Botany ÷ Flowering Plants.	(2)
(b) Botany ÷ Ecology of Plants.	(1)
(c) Botany ÷ Flowering plants ÷ Ecology of plants.	(3)

This is how these three documents will be classified. The principles of helpful sequence will give them the sequence of arrangement mentioned against each. If these terms are converted into numbers, scientifically worked out, that will be the assignment of notation to them.

(vi) **Major issues regarding Facets.** Now we have to decide the following important questions : (a) How many

facets or categories are possible in a subject ? (b) Do all the subjects possess different types of facets ; or is there similarity between the facets of different subjects ? (c) Will all the subjects be divisible into facets or some will not lend themselves to division ? (d) What should be the sequence between different facets ? (e) What shall be the structure and process of division of facets ? (f) How to indicate different types of relations between the units of facets ? And so on.

Before we take up these major issues, it will be necessary to mention that Ranganathan has expounded certain theoretical principles to deal with these issues. What others have contributed on these issues is not comprehensive. If their contribution is significant, then we have to admit that their starting points had been the formulations by Ranganathan. This argument, however, in no way means that all what Ranganathan has contributed to this topic is the final word. But before we think of rejecting Ranganathan's postulates it is necessary that principles other than his, should be proposed and examined comparatively.

(a) **Number of Facets or Categories in Main Classes.** Ranganathan has postulated five fundamental categories, namely :

(1) Time (2) Space (3) Energy (4) Matter (5) Personality.

According to him most of the subjects are divisible in these five categories (aspects or points of views). That is, a subject may have a Personality aspect, a Matter aspect, an Energy aspect, a Space aspect, and a Time aspect. The isolates of PMEST under different subjects may be different in idea plane but the types of characteristics which will yield them will be more or less the same, and if different, they will be relevant to the subject concerned and its particular facet.

TIME

Time is a simple concept. It indicates that the entities under different subjects must go on changing in its structure, meaning, history, development, etc., with the progress of time. Subjects get expounded differently with the progress of time. Suppose it is the question of science in the 20th Century. It differs in its structure, and development, etc., from the science of the 19th Century or the 18th Century. Like this, time occurs under every main class. So all possible divisions of time including century, decade, year, month, day, hour, etc., together may form a facet of a subject. In CC, we find a "Chronological Table" and this can be applied to any subject requiring time facet. In DC, we find that Time as a facet of a subject has been used under the classes History, Literature and at other places. The need for this facet is due to the necessity of distinguishing between the documents on a subject differing only from the point of view of time. Further, the following examples will justify the need for Time facet under a subject :

- (a) International Organisations in 1925.
- (b) International Organisations in 1963.

In the above specific subjects the isolate of International Organisations is common, *i.e.*, the same. So these two subjects should go together, but the time isolate concerning them differs. In one subject it is 1925 and in the other it is 1963. We will find a difference between the areas of two subjects. Therefore, under the subject International Organisations, we should provide for a sub-division on the basis of time.

SPACE

Space is no less important than time in its being a facet of a subject. Most of the subjects, if not all, get manifested, in relation with continents, countries and their sub-divisions. Music in Europe is different from that in Africa. Painting in India is of different style than in Japan. Economics of Soviet Union is different from that of the United States. History of different countries will often

vary. You will always find difference, a vast one, in the scope of subjects if they are related with Congo on the one hand and New York on the other. Space matters in the manifestation of a subject, and because the approach by people to a subject is often in accordance with its scope prevalent in a particular geographical area, individualisation through space becomes a great necessity. Ranganathan considers the surface of the earth as manifestation of the fundamental category space and it is required under every subject for indicating local description (variation) or local history, as he puts it.

In CC, we find a schedule of Geographical Divisions which can be attached to a subject. In DC, we find the space facet applicable under the class History and throughout the scheme the facet is available under the direction divide like 940-999. At places where the above instructions are not given and the division is found necessary according to countries, etc., one can get it as a division of '094-099' under form divisions. DC has fully provided for the space facet in its divisions. Palmer and Wells⁶ feel that it is an intuitive recognition by DC. One should not forget that to Melvil Dewey and to his editors, the individualisation of classes from the point of view (facet) of space had always been a vital thing and therefore, in addition to general provision under form divisions, they occur at uncountable number of places in DC schedules.

ENERGY

The fundamental category Energy covers the problems, actions including methods, functioning, etc., aspects of a main class. Palmer and Wells further qualify it as a mode of work or approach. Mills feels that Energy is a category or facet which characterises the exercise of energy, *i.e.*, activities, operations, processes problems, etc. Many main classes will have certain units which deal with the problems in the subject. These problems are generally applicable to all the organs of the class. In class Agriculture we find certain processes and actions like sowing

⁶ Palmer and Wells : Fundamentals of Library Classifications,

and harvesting. In Botany, Zoology and Medicine we find units like Physiology and Pathology which deal with functioning. Isolates which make the category Energy are generally the important problems of the subject and command a greater influence on the subject from two directions. One is, when they are in general reference to the class and the second when they refer to the organs of the subject individually. For example, Morphology, Physiology and Pathology are at one hand the general disciplines in Biological Sciences and Medicine, and are referred to as abstract techniques in relation with respective main classes. But when they are connected with a particular family of animals or plants and are in relation with various organs of human body, they deal with concrete entities in their context.

A further clarification of Energy is given by Ranganathan when he deals with common energy isolates, viz., Intellectual activities, Industrial activities and Institutional activities. He identifies Energy with activities. When they are common to all they become common isolates and when they are special to a class, they make its fundamental category Energy. In short, therefore, energy deals with activities and problem aspects (or points of views) in a subject.

Both CC and DC incorporate fundamental category Energy in their main classes as illustrated below :

<i>Main Class</i>	<i>DC No.</i>	<i>Energy Facet</i>	<i>CC No.</i>
Botany	581.1	Plant Physiology	I : 3
Botany	581.2	Plant Pathology	I : 4
Botany	581.4	Plant Morphology	I : 2
Botany	581.5	Plant Ecology	I : 5
Education	375	Curriculum	T : 2
History	327	Foreign Relations	V : 19
Economics	337	Tariff Policy	X : 53
Chemistry	543	Analytical Chemistry	E : 3

The above topics are the Energy aspects in different main classes in DC and CC.

Ranganathan postulates that the energy aspect in a main class may manifest itself in different rounds of energy. 2E=second round of energy after 1E; 3E=third round of energy after 2E, and so on. In a subject like the main class medicine, pathology or disease is a problem and therefore it is [1E] of the subject. Treatment and surgery, etc., are for actions on diseases themselves and therefore they are the [2E] of the subject. A particular subsequent round of energy facet may be further subdivided by its own Personality, Matter and Energy facets.

In *Classification and Communication*, Ranganathan says that Energy is perhaps the most ubiquitous of all the fundamental categories and he expects that there can be no basic class whose subjects do not present an energy facet. On the potency of this facet Ranganathan says, "The efficiency of a scheme of classification and its expectation of life will be determined largely by its capacity to isolate, handle and organise energy facets in different subjects. For it is energy which leaves its trail in space-time. It is only when energy facet develops that personality gets differentiated and becomes comprehensible. Such is the potency of energy facets."

MATTER

The fundamental category matter has been defined by a number of thinkers.

To Mills : Matter is the category of facets which reflect substances, materials, etc.; it is manifested clearly in most technologies, and in many of natural sciences; it is generally absent from theoretical disciplines like Law, Economics, Literature.

To Vickery : Matter comprises constituent materials of all kinds.

To Palmer and Wells : This is another fairly simple concept to visualise in the forms it takes in various

subjects. If we were classifying books on the manufacture of paper we should want some divisions based on the raw materials ; this would relate to the concept matter. The first characteristic of division (in DC) for 691, building materials, is based on Matter.

Ranganathan postulates Matter as a fundamental category capable of manifesting itself as the "constituent of a whole". In his *Classification and Communication*, Ranganathan recognises different levels of manifestation of matter—matter qua matter ; substance ; commodity ; artificial and prefabricated commodities.

Matter facet is inherent in many subjects falling within main classes. But those in which it is enumerated in CC are : Library-Science, Engineering, Sculpture, Painting and Music. The main classes Economics, Sociology and Anthropology, have now sufficient literary warrant calling for a schedule of matter isolates for use in classifying the subjects belonging to them. There can be different levels in the manifestation of matter in a main class, like M_1 , M_2 , M_3 , M_4 , etc.

PERSONALLITY

The fundamental category Personality is most concrete and the category Time is the most abstract. Mills thinks that Personality does not correspond to any recognisable and consistent characteristic. Yet, Personality facet is the category of first importance in many of the subjects belonging to any class, and while being so, it is the most recognisable facet at least to the specialists of a class. Mills himself says : "The term personality is used to describe those facets of any subject which are generally unique to that subject and which give it its essential character or personality." Palmer and Wells rightly feel that it is not really difficult to recognise the Personality facet of a class. They consider it the wholeness of any subject

Personality is the first facet in many subjects and it is often experienced that the other facets work as attributes of personality for its further sub-divi-

sion. Matter, Energy, Space and Time are often required in relation with personality facet, and it is comparatively in lesser degree that they are required in direct relation with the main class, as a whole, wherein Personality also remains diffused. Such important Personality isolates in subjects belonging to different Main Classes are, for example, crops in Agriculture ; human body in Medicine ; educands in Education ; substances in Chemistry ; business in Economics ; groups in Psychology and Sociology ; families of plants and animals in Botany and Zoology, respectively, communities according to Geographical areas in History and Law ; and name of the language in Linguistics and Literature, etc. These isolates (Personality) are vital and can thus be termed as first among the equals, or the Prime Facet, etc. In short, the personality of a subject will be a vital area which forms the body of the subject or makes its basic structure. Without personality there can be no organ, constituent, attribute, action, etc. Any main class, where categories are applicable, may have the personality facet. They were almost first to develop under each main class and it was only later on that other aspects of a main class came into importance for study and research, etc.

Within the Personality facet, we find a number of levels into which the whole personality is spread. These are known as levels of Personality facet. P_1, P_2, P_3, P_4 and so on. The different levels are arranged with the help of the principles of helpful sequence. The Systems and Specials are also considered a manifestation of Personality and because of their wider jurisdiction they precede other levels of the facet. Both in DC and CC, the fundamental category personality is enumerated, for example :

<i>Main Class</i>	<i>DC No.</i>	<i>Personality facets</i>	<i>CC No.</i>
Psychology	132	Abnormal Psychology	S 6
Economics	336	Public Finance	X 7
Chemistry	546	Inorganic Chemistry	E 1

Main Class	DC No.	Personality Facets	CC No.
Chemistry	547	Organic Chemistry	E 5
Botany	586	Cryptogamia	I 1
Zoology	596	Vertebrates	K 9
Engineering	621	Mechanical Engineering	D 6

Levels of Personality

Illustration A

Personality Facets

Main Class	P ₁	P ₂	P ₃	P ₄
Literature	Language	Form	Author	His Work

Illustration B

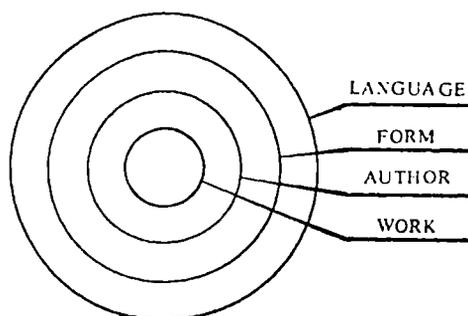


Illustration C

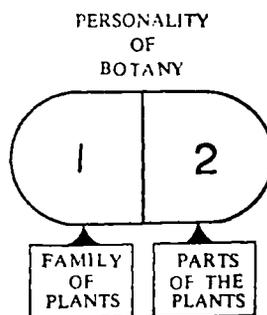


Fig. 9

The above illustrations indicate the existence of levels in Personality. The characteristics have been named and with their help isolates are enumerated.

(b) **Similarity between Facets of Main Classes.** Personality, Matter, Energy, Space and Time are five general fundamental categories under different subjects. These

concepts have similar meanings whatever the class be. But as these categories are optional and not compulsory, all may not be present in all the subjects or documents on a subject.

(c) **Are all Subjects divisible into Facets?** The concept of categories should be applicable in all subjects. Its application only under certain subjects shall not be a sound principle. It is not impossible to divide all subjects in their respective categories, but due to the traditional practice, certain subjects should not be divided into its facets. Such subjects are known as Canonical Classes. Probably, their divisions in traditional manner is still more helpful than the helpfulness, our attempt to categorise them would yield as in the case of Mathematics, Philosophy, etc. Ranganathan calls them the Canonical Classes because they are divided on canonical lines.

(d) **Sequence between Different Facets.** The principle of concrete before abstract (*i.e.*, increasing abstractness or decreasing concreteness) is a sound principle of helpful sequence. With the help of this principle the sequence between the five categories is as follows :

Personality, Matter, Energy, Space, Time.

In order to distinguish between them in notation, different connecting symbols have been prescribed by Ranganathan :

- , Comma for Personality Facet.
- ; Semi-colon for Matter Facet.
- : Colon for Energy Facet.
- . Point for Space Facet.
- ‘ Single inverted comma for Time Facet.

(e) **Process of division of Facets.** Facets are divided into their isolates. They are generally enumerated in the

schedules of a scheme of classification. The personality facet in main class Education comprises the types of educands. They are enumerated in CC Schedule :

Isolates under [P] :

- 1 Pre-secondary.
- 2 Secondary.
- 3 Adult.
- 4 University.
- 5 Sex.
- 6 Abnormal.
- 7 Backward.
- 8 Other classes.

The energy facet in main class Education comprises the various problems. They are enumerated in CC as follows :

Isolates under [E] :

- 1 Nomenclatures, etc.
- 2 Curriculum.
- 3 Teaching technique.
- 4 Students' work.
- 5 Educational measurement.
- 6 Physical education.
- 7 Student life.
- 8 Management.

The isolates mentioned under [P] and [E] categories are further sub-divided into sub-isolates if the need arises.

(f) Relations between the Different Units of Facets.
The analysis of a specific subject, having an isolate each

from five or less number of categories, into its constituents is facet analysis. Suppose the specific subject is curriculum for secondary education in India in 1963 :

Notation in CC Synthesis				
Main class	Personality	Energy	Space	Time
Education	Secondary	Curriculum	India	1963
T	2	2	44	N63

T 2 : 2. 44 'N63.

This type of relation between different facets of a subject is known as facet relation.

When one isolate of a facet is in relation with another isolate within the same facet, for example, relation between Secondary and University education, this type of relation is known as intra-facet phase relation.

T 2○ j 4

There is still a third type of relation possible within a facet. When two sub-isolates of an isolate are in relation with each other, this is known as intra-array (Sub-isolates in a facet) phase relation, for example, influence of man on woman.

Y 15○ y 16

Here woman and man are the sub-isolates under the isolate 'group determined by age and sex'. The relation exists between the two sub-isolates.

Conclusion. To sum up, the fundamental categories is a unique concept. It is extremely useful. Its influence has been far and wide. It is mainly because of this concept that Sayers said that if there was an age of Melvil Dewey, this (modern) is certainly an age of Ranganathan. de Grolier⁷ says, "CC is the first basically multidimensional bibliographic classification which has ever been conceived. Ranganathan has played a pioneering role ; without his work a great part of the movement of ideas, which has

7. de Grolier—A Study of General Categories, p. 57.

manifested itself in recent years in the field of bibliographical classification would probably not have taken place." The postulate of fundamental categories has shown a new path. It matters little whether the categories are five in number or seven or still more. One will agree with the views of Prof. S. Das Gupta who asserted (in one of my discussions with him) that it may be too much to start and too less to end with five fundamental categories. The phenomenon of dynamic universe is, however, very much under control because of the postulates regarding rounds and levels. The fact is that in this field a better alternative to Ranganathan's principles is yet to be expounded. It is not impossible to expound them. But when will they be expounded? The gap will probably be the same as between Newton and Einstein or may be lesser due to Space Age. If the 19th Century witnessed the exposition of one aspect in a document, many of the 20th Century documents comprise many facets. It is to suit the later mode of exposition that the concept of five fundamental categories works for solution of individualisation.

In the course of my teaching, I have been explaining to my students the concept of PMEST with the help of an analogy. Think yourself for a moment equal to a subject. Your body is the Personality; the substances etc. that make your body are Matter; your power, problems and movements etc. are Energy; your presence in India, U.K. or U.S.A. is Space; and your relations with 1955, 1960 and 1962 etc., are the manifestations of Time. In the same manner, the body of a subject is its Personality facet; substances that make the body are the Matter facet; its problems and energy are manifestations of Energy; its reference to a geographical unit is Space facet; and its relationship with the units of chronology is its Time element. These are the Five Fundamental Categories.

Principles for Arrays.

An array is a group of coordinate classes. At every stage in the process of division arrays are formed. There is an array of co-ordinate classes at the level of the three areas—Natural Sciences, Humanities and Social Sciences. After this, we find an array of

Main classes. PMEST are really in an array as sub-divisions of a subject. These facets are further divided into isolates, which form separate arrays. Each isolate is further sub-divided and their divisions form an array of sub-isolates. These levels of arrays are distinguished as first order array, second order array, third order array and so on. Ranganathan⁸ has defined an array in the following words :

“An array is the sequence of the classes of a Universe, derived from it on the basis of a single characteristic and arranged among themselves according to their ranks.”

Arrays are formed at every stage in the process of division of knowledge and every order of an array is derived from some bigger whole with the help of a train of characteristic. It is certain that arrays cannot be formed at random or in a ‘as you please manner’. There are four requisites, which an array should satisfy. The first requisite of an array is that it should accommodate in it all that is available in the upper class (immediate universe) which is under division. The second requirement of an array is that the isolates in it should not overlap one another. The third quality needed for it is that the classes in an array should be arranged in a helpful sequence. The last feature of it is that whenever similar things are repeated and required to be arranged in a sequence, they should be in the same helpful sequence as at the first place of their occurrence. Ranganathan has formulated four canons for these requirements. These canons should be observed by the schemes of classification in the formation of arrays. These canons are :

- (i) Canon of Exhaustiveness ;
- (ii) Canon of Exclusiveness ;
- (iii) Canon of Helpful Sequence ; and
- (iv) Canon of Consistent Sequence.

(i) **Exhaustiveness.** This canon demands that while sub-dividing a class of any extension, it should be seen that all its entities find a place in one of the sub-classes,

8 Ranganathan (S R) : Prolegomena to Lib. Clas., p. 43.

in the array derived from it, meaning thereby that nothing which is available in the common immediate universe under division should be left out of the classes in an array Suppose that the fundamental category [P] of the main class Geography is to be divided. The divisions of this class will form an array. The demands of this canon are shown in the following illustration :

UNIVERSE [P] OF MAIN CLASS GEOGRAPHY

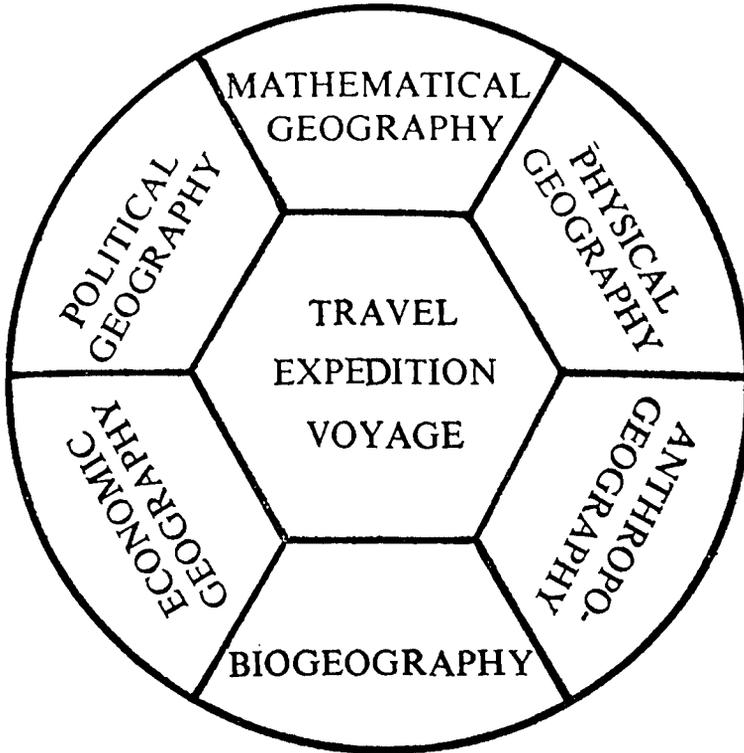
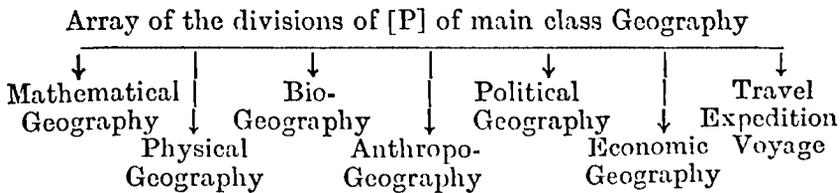


Fig. 10



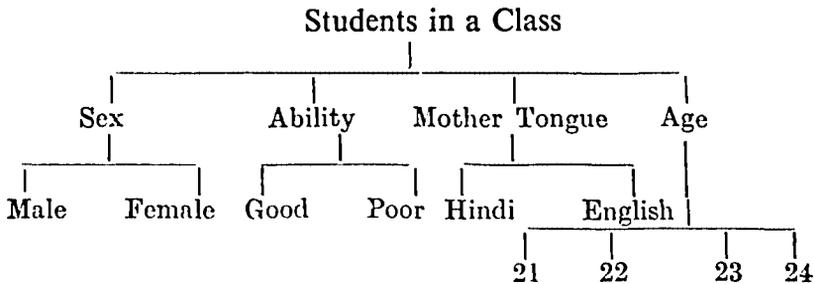
These seven classes are co-ordinate among themselves and are derived from one universe. Exhaustiveness means

that none of these seven classes should be omitted. Suppose the class number two, *i.e.*, Physical Geography fails to find a place in the array. This will mean that the division is incomplete and all things that are available in the circle have not been accounted for. This absence of a sub-class is the violation of the canon of exhaustiveness. Really speaking, no scheme of classification can afford to miss a sub-class in the array. But it may happen that one may not know of all the possible sub-classes of a subject.

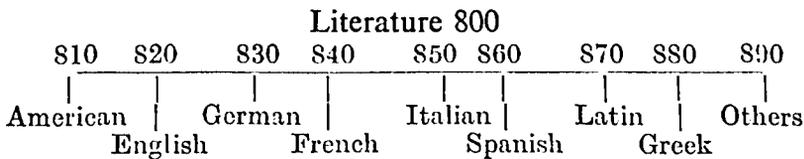
In that case, the best method is to leave gaps, so that whenever, in future a sub-class is fully recognised it is duly accounted for. This problem will arise in case of notation of a scheme of classification. Regarding the already existing sub-classes, the classificationist is bound to provide for all. Mills has found fault in the verdict of this rule when he argues that a class can be perfectly exhausted with the help of dichotomy (*i.e.*, reorganising only two sub-classes at one stage). But this is a poor way of doing the job, where one is no doubt, technically free from committing a mistake but the results got by dichotomy will be of no use. Therefore, one should exhaust the immediate universe by giving allocation in detail, the range of which may vary from one scheme to another, and from one point of time to another point of time. The phenomenon of growth and extension in the number of sub-classes (of a class) to be accommodated in an array is a regular one and it is because of this feature that concept of hospitality in array (discussed elsewhere) has been emphasised.

(ii) **Exclusiveness.** The canon prescribes that the isolates in an array should not contain items common to two or more isolates in that array. In other words, no overlapping between the classes in an array should exist. Because, when the two classes will coincide in part with each other, the question arises which class that common part should belong to? It implies that while dividing a class into the array of its sub-classes it should be seen that all the sub-classes are different among themselves and in order to do so, each will have to be derived on the basis of a different single characteristic. This will assure that

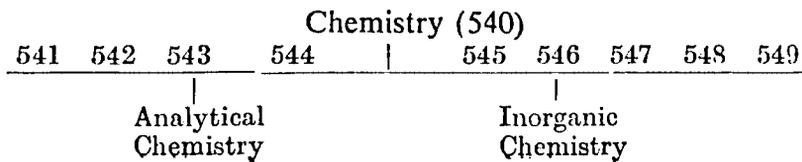
a particular entity does not find a place in more than one class in the array. In other words, there shall be only one place for each entity in the array. The following example will illustrate the implications of this canon :



There are four classes in the array derived from the universe of students in a class. Suppose you want to classify Mr. David, an able person of 21 years of age. Under which class should he be placed? According to sex or ability or mother tongue or age, he will fall under all the four classes in the array. This is the worst possible situation in a scheme of classification and will lead to cross classification. One of the best examples of the observation of this canon is in DC.



All these classes in an array comprise poetry, drama, fiction, essays, oratory, letters, etc. To arrive at German Poetry one will go to the class German and then to its Poetry. Therefore, the classes in the array are mutually exclusive. An example of the violation of this canon is provided by the following array in DC :



Suppose, the specific subject for classification is analytical chemistry of inorganic substances. To which class (543 or 546) this subject should go? The situation here is not as it was in the case of German Poetry. While both the classes have their claims for the specific subject, we have to select one and reject the other. This is a very difficult situation which is beyond the control of Merrill and the 'Guide to Dewey Decimal Classification', where satisfactory solutions are not available. The etiology of this weakness in DC is that the divisions of 540 are not mutually exclusive.

(iii) **Helpful Sequence.** The canon of Helpful sequence demands that classes in an array should be arranged in a helpful manner. If there are four classes in an array, there will be $1 \times 2 \times 3 \times 4 = 24$ possible sequences. How to determine that one particular sequence is most helpful than the remaining 23 sequences? This problem has been attended to by a number of thinkers including Bliss, Richardson, Sayers, Ranganathan, etc. If we have to organise the subjects of different extensions in a helpful sequence there is not much difficulty. The principle of decreasing extension will help us. But how to decide the sequence between the co-ordinate classes which make an array? Bliss uses the term 'Collocation of co-ordinate classes' and says that they should be arranged or collocated with regard to their characteristics, and relations and the interest and purpose. Sayers has summarised the following principles formulated by Richardson :

- 1 Logical—from complex to the simplest.
- 2 Geometrical—position of items in space.
- 3 Chronological—position according to time.
- 4 Genetic —per likeness in origin.
- 5 Historical—combination of preceding characteristics.
- 6 Evolutionary—from simple to complex.
- 7 Dynamic—sequence of power.
- 8 Alphabetical.

9 Mathematical sequence through the value of notation.

Principles 1 and 6 are opposite to each other ; 2, 3, 8 and 9 are simple to determine and are useful. Principles 4, 5, and 7 are often difficult to determine. Ranganathan too expounded 2, 3, 6, 8 and 9 of these principles, and in addition, introduced (a) the principle of Decreasing Extension and (b) the principle of Increasing Concreteness. In spite of these principles it is not always possible to be sure of the most helpful sequence in different orders of arrays. In the array of Main Classes, the helpful sequence is often maintained unless 400 linguistics and 800 literature are put poles apart, as in DC. The concept of PMEST gives a helpful sequence to the facets of a main class and it is always maintained. But the most difficult situation arises when we have to think of the helpful sequence between the Isolates of a fundamental category of a subject. Here two facets, time and space create no difficulty. But under the divisions of Energy, Matter and Personality, the most helpful sequence is difficult to determine. As the helpful is distinguishable from unhelpful, it is certain that a helpful sequence can be enumerated. But to claim that a particular sequence is the most helpful sequence, is a doubtful statement and it cannot be proved. A satisfactory helpful sequence is, however, possible for isolates of a facet with the help of the following principles :

- (a) Principle of later in evolution ;
- (b) Principle of increasing complexity ;
- (c) Principle of canonical sequence ;
- (d) Principle of favoured category ; and
- (e) Principle of alphabetical sequence.

Let us consider the isolates of the fundamental category [E] of the main class Biology for determining a helpful sequence between them,

ISOLATES IN [E] OF BIOLOGY

<i>DC Sequence</i>	<i>CC Sequence</i>
574 .1 Biophysiology	G : 1 Preliminaries
.2 Pathology	G : 2 Morphology
.3 Embryology	G : 3 Physiology
.4 Biomorphology	G : 4 Pathology
.5 Bioecology	G : 5 Ecology
.6 Economic Biology	G : 6 Genetics
.8 Microscopic Biology	G : 7 Onotogeny
.9 Natural History and Biography.	G : 8 Manipulation

All will agree that Preliminaries should come first of all. Morphology, *i.e.*, structure should precede Physiology, *i.e.*, functioning, because functioning is of the structure. Therefore, first comes structure and then comes its functioning. Pathology is of structure and functioning, hence it should find a place after them. CC maintains this sequence. In DC we find that Physiology not only precedes Morphology but both are separated. Preliminaries, like natural history, come in the end. Thus, in comparison, one can say that the sequence in CC is more helpful than in DC. But at the same time it will be a doubtful statement to say that the sequence in CC is the most helpful one and/or the sequence in DC is not at all helpful. The difference between them is just in the degree of helpfulness.

(iv) **Consistent Sequence.** The consistent sequence means that whenever the similar isolates occur in an array, their sequence should be the same as determined at the place of first occurrence. For example, the isolates—Morphology, Physiology and Pathology occur under Biology, Botany, Zoology and Medicine. Their sequence under these classes should be the same. If the same sequence is not maintained it is the violation of this canon. Let us take an example from DC.

*Sequence in DC**Sequence in CC*

Biology	Botany	Zoology	Medicine	Isolates	Biology	Botany	Zoology	Medicine
4	4	4	1	Morphology	2	2	2	2
1	1	1	2	Physiology	3	3	3	
2	2	2	6	Pathology	4	4	4	4

In DC, we find that consistent sequence between these isolates has been maintained in Biology, Botany and Zoology. But the sequence between these isolates under Medicine is different. This is the violation of the canon of consistency. In CC, we find that the sequence under all the four classes is the same. Consistency is a general principle not only in classification of knowledge but in other areas of life as well. It should not be violated.

Hospitality in Array in Notation. The field of knowledge has grown enormously. It is still growing and is bound to develop in future. All items of knowledge are accommodated in arrays of different orders. As knowledge is charted through notation in a scheme of classification, the array in notation should be hospitable. It should be able to accommodate any number of coordinate classes. Melvil Dewey found the decimal fraction of Arabic numbers most suitable for notation. It is most useful in case of arrays of Isolates and orders beyond it. CC has also used it. But the size of Arabic numbers is limited to 1 to 9. If we assign a digit to each isolate in an array, the maximum number of co-ordinate isolates which can be allotted digits will be only nine. If there are not more than nine co-ordinate classes in any array no problem will arise. But we find that co-ordinate classes in many arrays are much more than nine in number. Due to this phenomenon, the crisis arises in notation. The situation reveals that no direct and simple solution can be found. DC and UDC used 'Others' device with the digit 9. This meant putting more than one class, may be 100, together. This method is unsuitable for the purposes of classification.

Ranganathan has been able to find certain ways to help solve this crisis. To make a notation hospitable in array, he uses the following devices :

- (a) Interpolation Device ;
- (b) Sector Device and Group Notation ;
- (c) Chronological Device ;
- (d) Alphabetical Device ;
- (e) Common Isolate Device ;
- (f) Zone Device (Analysis) ; and
- (g) Subject Device.

(a) **Interpolation Device.** It looks after the cause of hospitality in array mostly at the level of main classes. A digit of almost similar meaning in another language is inserted between the two digits of a particular species already used in notation. In CC we find the use of beta, lambda, mu, etc., of Greek alphabet used after B, before

L and after M, respectively. The notational value of new digits is fixed at the relevant position. It is in this manner that more places are created in a notation to accommodate newly developed subjects at relevant places.

(b) **Sector Device and Group Notation.** Confronted with a situation where the number of classes in an array is more than nine while digits are limited to nine, Ranganathan decided to sacrifice one out of nine digits (*i.e.*, digit 9) believing in the dictum 'Sacrifice begets plenty' and he actually got plenty. When he decided not to use digit 9 in the concept of decimal fraction notation, the divisions of 9, *i.e.*, 91, 92, 93, 94, etc., will not be used as sub-division of 9. Therefore, they can be brought on a par with digits 1 to 8. If the number of entities is more than 16, he will again not use 99 leaving its divisions 991, 992, 993, 994, 995, etc., unused and they too will be brought on a par with 1 to 8 and 91 to 98. If the number of isolates is more than 24, this process will go on. Therefore, we will get the necessary number of digits to accommodate any number of isolates in an array. For example :

1, 2, 3, 4, 5, 6, 7, 8, 91, 92, 93, 94, 95, 96, 97, 98, 991, 992, 993, 994, 995, 996, 997, 998, 9991, 9992, 9993, 9994, 9995, 9996, 9997, 9998 and so on. There will thus be different sectors in an array. For example :

Ist Sector	2nd Sector	3rd Sector	4th Sector	5th Sector	6th Sector
1	91	991	9991	99991	999991
2	92	992	9992	99992	999992
3	93	993	9993	99993	999993
4	94	994	9994	99994	999994
5	95	995	9995	99995	999995
6	96	996	9996	99996	999996
7	97	997	9997	99997	999997
8	98	998	9998	99998	999998

In this way the notational status of 1, 97, 994, 9996, 99992, 999993 (belonging to different sectors) will be the

same. It is through this simple but useful technique that Ranganathan suggested hospitality in array, when an array is required to accommodate more than 9 classes. Later on, the concept of sector was extended to species of digits other than Arabic numerals. Capital and lower case Roman alphabets used in CC also follow the principle of sector device. One can understand the notational burden if five nines 99999 are used to accommodate 41st to 48th classes. More number of nines will be required if isolates are more than 48, 64, 72, etc. To reduce the burden on notation Ranganathan expounded the concept of Group Notation for providing hospitality in an array if the isolates are in great number. The thesis of group notation is, sacrifice the use of one digit numbers. To individualise the first entity use two or more digits at a time. This means sacrifice of one digit numbers and if need be, sacrifice of even two digit numbers. But the hospitality which this sacrifice provides for is much greater than what sector device can ever afford. Group notation is adopted by grouping the characteristics. In CC, for example, the main class J Agriculture incorporates it. Here we have utility array, and part (useful) array and with the help of these two groups, species of plants are arrived at in the third array.

<i>Group 1</i>	<i>Group 2</i>	<i>Group 3</i>
Utility Array	Plant Part (Useful) Array	Species of Plant Array
1 Decoration	1 Sap	1 } Used for
2 Feed	2 Bulb	2 } individualis-
3 Food	3 Root	3 } ing a parti-
4 Stimulant	4 Stem	4 } cular species
5 Oil	5 Leaf	5 } of a plant.
6 Drug	6 Flower	6 }
7 Fabric	7 Fruit	7 }
8 Dye. Tan	8 Seed	8 }
91 Adhesive	97 Whole Plant	
92 Manure		
93 Vegetable		
94 Sugar Producing		

For individualising any plant, one will have to take one digit from each group. Though it is not a good example yet it is easier to understand the concept of Group Notation by this example. Suppose we have to get the number for rice. Rice in group 1 is relevant to digit 3 Food. In group 2 it is associated with digit 8 seed because Rice is the seed part of the plant. From group 3 we may take digit 1 because Rice as a seed used for food is the most popular grain in the world. So the number for rice plant is J 381. In order to arrive at the number for any plant the minimum number of digits required will be 3, one from each group. This is the concept of Group Notation. Work number in literature is another use of it. In *Prolegomena*, Ranganathan has given a table of critical numbers for the number of the significant digits used in Group Notation. Group Notation provides far greater hospitality in array with the use of less number of digits. The concept is a great contribution to the classificatory thought.

✓(c) **Chronological Device** : Chronological device is often used in such arrays where isolates are based on Time element. In case of an author in the main class literature or in case of a system under main classes, the isolates are worked out on the basis of the year of birth of an author and the period of origin of a system, respectively. These isolates are suitably individualised with the chronological device and any number of isolates can be accommodated in an array for which notation can be worked out by translating the time element concerned.

Examples :

<i>For Authors</i>	<i>No.</i>	<i>For Systems</i>	<i>No.</i>
In English Literature		In Psychology	
Shakespeare	✓ J64	Experimental	✓ SM
Shaw	✓ M56	Gestalt	✓ SN

✓(d) **Alphabetical Device**. This device is often a last resort in classification for individualising isolates in an array. A,B,C,D,E.....X,Y,Z, etc., can be used for individualisation of ideas in notation. This also provides hospitality in array.

✓(e) **Common Isolate Device.** The common isolate device also provides for hospitality in an array.

✓(f) **Zone Analysis.** It is another important concept which provides for great hospitality in any order of arrays. It may be the order of main classes ; Isolates, sub-isolates or any further lower order. The concept is dependent on the use of mixed notation, wherein a particular type of notation is used for respective types of ideas. Ranganathan recognises four types of isolates .

- (i) ECI—Enumerative Common Isolates ;
- (ii) ESI—Enumerative Special Isolates ;
- (iii) DSI—Devised Special Isolates ; and
- (iv) DCI—Devised Common Isolates.

There are different types of digits specified for each type of Isolate :

- (i) For ECI—Lower case alphabets, a,b,c,d,e,f,g...
...x,y,z.
- (ii) For ESI—Arabic numbers, 1,2,3,4,5,6,7,8, in
decimal numbers
- (iii) For DSI—Capital alphabets, A,B,C,D,E,F,G,H...
...X,Y,Z.
- (iv) For DCI—Numbers in brackets () ()

According to this concept any order of array can be divided into four zones. Each zone has the provision of hospitality in it. Therefore, total potency of hospitality through zones is much higher. It can handle the dynamic growth in knowledge in a suitable manner (zone analysis is discussed in Part IV).

(g) **Subject Device.** The number of isolates in an array of any order is unlimited; unlimited in the real sense of the term. It is more so because of the phenomenon of specialisation and inter-borrowing of isolates between different main classes. One great feature in this direction is the temporary occurrence of isolates of one main class

under different main classes. This leads to the provision for accommodating any isolate in an array. The situation is more dominant in the documents. The notation should be equipped to translate it whenever the need arises. This has been done in DC with the help of the instruction 'Divide like 000-999' at number of places CC has also provided for it. The method in CC is to put the number of the isolate required (along with its main class number) in a bracket and attach it to the main class where it occurs. For example.

1. Psychology of University Teachers S4 (T4)
2. Hindu Ethics R4 (Q2)
3. Industrial Microbiology F : (G91)

This device also provides for plenty of hospitality in an array. It is generally seen that the order of such arrays where temporary occurrence takes place is mostly in lower orders of arrays.

With the help of these devices the notation of a scheme of classification is in a position to provide for hospitality that is required under it.

Principles for Chain

The term chain in the classification of knowledge stands for a sequence of classes, not co-ordinate among themselves, where the second class in the chain is derived from the first class, the third class is derived from the second and the fourth class is derived from the third class in the chain, and so on. In the end, we find that the last class has been derived from the penultimate class in the chain. In a chain of classes the preceding class is the immediate universe from which the successive class is taken out. For example :

<i>DC</i>	<i>CC</i>
3 Social Sciences	B Mathematics
33 Economics	B2 Algebra
331 Labour	B28 Statistics
331.1 Industrial Relations	B281 Probability
331.11 Employment	B2813 Normæ Equation
331.114 Qualifications for Workers	

The classes mentioned under DC and CC are in a chain. Ranganathan⁹ defines a chain as a "Sequence of classes made up of any given class, its immediate Universe, and its Universe of the second remove, third remove, and so on. A chain may be arrested at any stage short of the original Universe." Mills¹⁰ gives a short but exact definition of chain. According to him, "A chain is a series of classes in successive sub-ordination, each one being sub-ordinated to the preceding one."

The chains in the schedules have to be worked out in a disciplined manner and not as one wishes. There are certain rules for it which should be observed in a scheme of knowledge classification. Ranganathan has expounded two canons :

(a) Canon of Decreasing Extension.

(b) Canon of Modulation.

(a) **Canon of Decreasing Extension.** It is an important principle of helpful sequence. A wider class should come before a narrower class. In case of a chain, this canon demands that the succeeding classes should always be smaller in extension to the preceding classes. Ranganathan has defined this canon thus : "While moving down a chain from its first link to its last link, the intension of the classes should increase, and the extension of the classes should decrease. This is the canon of decreasing extension." The concept of decreasing extension has been equated with the principle of general before special. But the general before special is the result of the application of this principle, which simply means that major should come before the minor ; or that a smaller unit should come after the bigger unit, whose part it is. The diagrams given on the opposite page represent this concept :

9 Ranganathan (S R) : Prolegomena to Library Classification, p. 45.

10 Mills (J) : Modern Outline of Lib. Classification, p. 41.

Diagram A

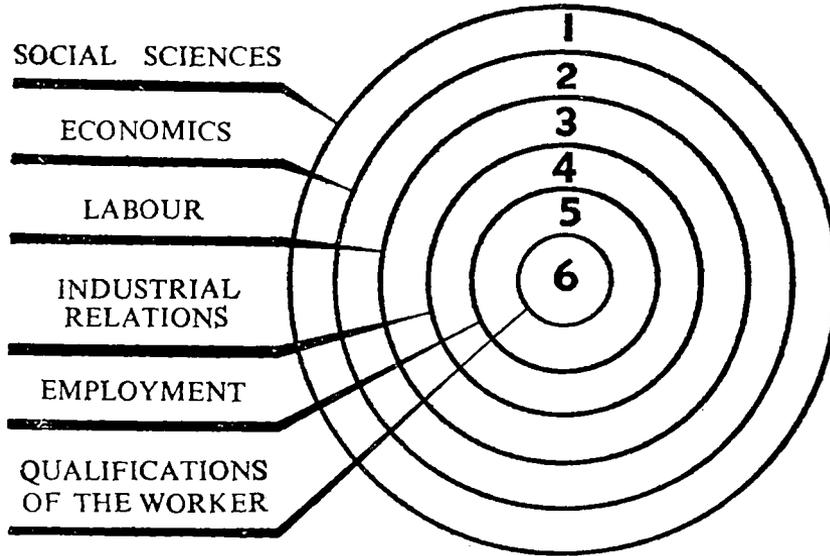


Diagram B

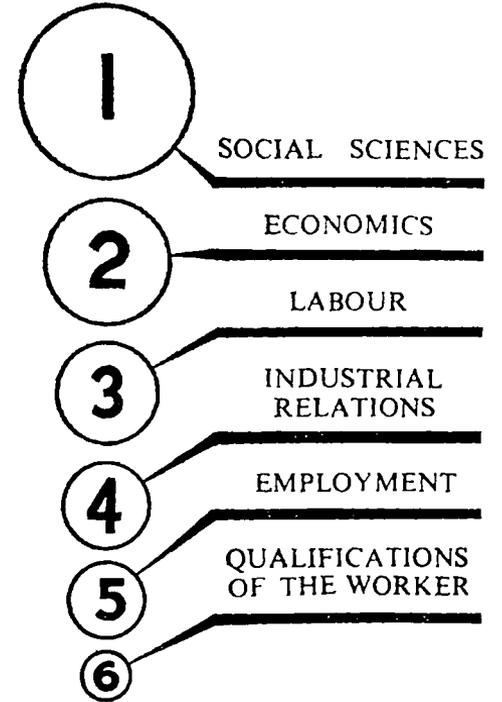


Fig.11

If we take out these circles from diagram A, we will find in diagram B that their extension is going on reducing from the first link to the last link. Circle 2 representing economics is lesser in extension than circle 1, but bigger in extension than circles 3, 4, 5 and 6; circle 3 labour is lesser than 1 and 2 but bigger than 4, 5 and 6. Circle 4 is lesser than 1, 2 and 3. Circle 5 is smaller than 4, but bigger than circle 6, and circle 6 is the smallest of all. In diagram A, we find that circle 6 is within circle 5; circle 5 is within circle 4; circle 4 is within circle 3; circle 3 is within circle 2; and circle 2 is within circle 1.

The canon of decreasing extension has been observed by DC and CC. The concept of decimal fraction notation of Melvil Dewey is to meet the primary need for indicating decreasing extension of the classes in a chain. Ranganathan has also adopted the decimal fraction notation in CC. In order to give proper representation, in notation, to various links of a chain, decimal fraction notation is necessary.

(b) **Canon of Modulation** : If the canon of decreasing extension prescribes as how to derive a chain, the purpose of the canon of modulation is to specify as what to include in the various links of a chain. In other words, what should comprise a chain from its first link to the last link? Ranganathan¹¹ suggests that "A chain of classes should comprise one class of each and every order that lies between the orders of the first link and the last link of the chain. This is the canon of modulation." The term 'each and every order' indicates that no important isolate in a chain should fail to find a place in the relevant link. To this Mills¹² mentions "steps of division should be proximate—that division should not make a leap". The value of this principle lies in avoiding the chances of ignoring a class at a particular link. If such a thing is not avoided a class will remain hidden. It shall not be possible to individualise it. A simple example of it is when we give a place to a grandfather at the first link; omit the place for the father and put the grandson immediately after the grandfather.

¹¹ Ranganathan (S R); Prolegomena to Lib. Classification, p. 74.

¹² Mill (J) : Modern Outline of Library Classification.

This will be alright for the canon of decreasing extension because the extension of the grandson is certainly lesser than the extension of the grandfather. The phenomenon that father should not be missing in between the links of the grandfather and the grandson, is the purpose of the canon of modulation.

An application of this canon in the making of schedules for knowledge classification is not a simple affair. No doubt at certain places it is not at all difficult to modulate all the links. For example, if the first link is the World and the last link is Paris ; one knows for certain that the sequence in chain will be World-Europe-France-Paris. But there are many places where the canon of modulation requires special care in selecting or rejecting a class at possible links. For example :

DC	Links in Chain	CC
33=Economics	1st link	X=Economics
336=Public Finance	2nd link	X7=Public Finance
336 2=Taxation	3rd link	X72=Taxes
336.27=Other Taxes	4th link	X729=Indirect Taxes
336.271=Indirect Taxes		
336.272=Stamp Taxes	5th link	X7299=Stamp Duty

We find that the first three links are common in both the schemes. The fifth link is also the same in the two schemes. The difference arises in the fourth link. Stamp Duty is an indirect tax and its upper link finds a place in CC, but not in DC, where we find that Indirect taxes are co-ordinate to Stamp taxes, and their common upper link is 'Other Taxes 336.27'. Here we find that the canon of modulation has been violated. The classificationists' knowledge of the class under division and of the literature avail-

able on the classes, determines the number of steps of divisions needed between a class from its first link to its last link. Ranganathan feels that the canon of Modulation requires further investigation. He, however, thinks that modulation should depend on :

1. Relevant characteristics allowed in a train of characteristics; and
2. Sequence of application of those characteristics. In the above example in DC, the fault lies only in the sequence of application of the characteristic 'indirect taxes'.

Hospitality in Chain in Notation : It is not sufficient that a notation should be hospitable only in its array. In order to deal with the dynamic growth of knowledge and its manifestations in various dimensions, particularly as embodied in documents, it is necessary that the notation be extremely hospitable also in its chain. A feature of knowledge is that the classes of greater intension crop up every now and then. This is an endless process. A subject of specialisation generally covers minor areas. For a long time atom was considered indivisible. But it is now established that it can be divided. In the same manner, previously an isolate was considered indivisible. But it can further be divided is now proved due to the growth of isolates. In a chain, one finds one facet of the class divisible by one or more other facets of the same class. This created the need for providing for them in notation so that documents of this type could be individualised. Another feature demanding for hospitality in chain is when two or more basic classes with or without their facets, make a peculiar specific subject as often revealed in many documents. Such documents depend on the notation for their individualisation. When such a relation exists at the level of main classes, with or without their facets, a miniature of it is noticeable when two isolates of the same facet or two sub-isolates of an isolate together produce a new specific subject. In order to handle such situations in the field of knowledge classification in notational plane, various devices have been invented by the profes-

sion. They are :

(a) Gap Device ;

(b) Decimal Fraction Device ;

(c) Facet Device ;

(d) Inter-subject Phase Relation Device ;

(e) Intra-facet Phase Relation Device ;

(f) Intra-array Phase Relation Device ;

(g) Superimposition Device.

(a) **Gap Device** : The gap device means leaving a limited number of gaps in the notation at various levels. This is a method generally adopted in notations which adopt integral (non-decimal fraction) numbers. Number of gaps that can be provided will be meagre in comparison to the number of new isolates that a scheme will be required to accommodate. This means that the scope of hospitality in chain is not much possible through this device. Two major schemes, *i.e.*, Library of Congress and Brown's Subject Classification adopted this device in a prominent manner to accommodate new classes.

(b) **Decimal Fraction Device** : This is a wonderful device which came from the pride of the library profession, Melvil Dewey. It is such a powerful device that for about 80 years it fought almost single-handed with the idiosyncracies of the universe of knowledge. About it Ranganathan¹³ says, "The most potent and everlasting contribution of the Decimal Classification (therefore, of Melvil Dewey) to the Philosophy of library classification is the demonstration of the practicability of securing hospitality in notation by the simple device of Decimal Fraction Notation." Due to this device every number in notation is considered as a pure decimal fraction. In knowledge classification for documents, we are forced to translate a class into an artificial language of ordinal numbers. Just as a class is divisible into various sub-classes, in the same manner the translated ordinal number should also be sub-divisible. This can conveniently be done

13 Ranganathan (S R) Philosophy of library Classification,

with the help of decimal fraction notation. For example :

Natural Sciences have been translated into digit 5 in DC.

Science=5									
500	510	520	530	540	550	560	570	580	590
Pure Sci- ence	Maths.	Astro- nomy	Phy- sics	Chem- istry	Earth Sci- ence	Paleon- tology	Anthro- pology	Bot- any	Zoo- logy

Digit 5 is for Science. To accommodate the divisions of Science, we will have to adopt the decimal fraction notation. This gives hospitality. This device has been adopted by DC, UDC, CC and BC. It would have been impossible for Colon to cut new grounds, if it had not adopted the concept of decimal fraction notation. Because the hospitality in chain is required in various directions, the decimal fraction device alone is not sufficient. It must be joined by other devices to provide for hospitality in chain.

(c) **Facet Device** : If the decimal fraction notation gave hospitality at one point, the concept of facet device provided for hospitality at many points. The versatility of facet device is $1 \times 2 \times 3 \times 4 \times 5 = 120$, when the versatility of decimal fraction is 1. The ratio between the two is 120:1. Such a remarkable difference was introduced by this concept. The following example will show the potency of facet device for hospitality :

Illustration A DC Notation	Illustration B Facet Device in CC Notation					
5 ↓ 54 ↓ 546 ↓ 546·3 ↓ 546·34 ↓ 546·342	MC 2	P 3	M 1	E 5	S 4	T N Step 1
if d	2	↓ 36	↓ 151	↓ 55	↓ 421	↓ N63 Step 2

In illustration A, we find that at each step only one digit representing a class has been added. In DC it is not possible to have simultaneously another point for expansion. In illustration B, we find that five points can expand simultaneously, as happened at step 2 in illustration B. CC has demonstrated that hospitality in chain resides not only at the end (as in DC notation) but at each of the junctions between trains of characteristics. The device is implemented by applying certain connecting symbols which are prescribed and are of lesser ordinal value than other digits. This device secures 'manifold infinite hospitality in chain'. The manner in which decimal fraction device is not itself sufficient to provide for all the hospitality required, in the same way the facet device alone or even along with decimal fraction device, is also inadequate. The fact is that more colleagues are required to work together in providing for the needed hospitality in the chains of a notation.

(d) **Inter-subject Phase Relation Device** : This phase device is required in a notation to meet a particular feature of mutual relations between the main classes, with or without their facets and isolates. Such mutual relations give birth to complex specific subjects, which throw a challenge to the notation of a scheme of classification. Following are the examples of such specific subjects :

<i>Specific subjects</i>	<i>Type of Inter-subject phase relation</i>
(i) Psychology for Teachers	Biased
(ii) Influence of Production on Culture	Influence
(iii) Comparison of Religion and Philosophy	Comparison
(iv) Difference between Engineering and Technology	Difference
(v) Relation between Physics and Chemistry	General

These are the five types of relations existing between two or more main classes. There may be many more

types of relations. If a document appears with such specific subjects, a scheme of classification should not feel any difficulty in individualising it. This demands securing additional single fold infinity for hospitality in chains. Ranganathan has expounded the following types of inter-subject phase relations and has provided for them in CC notation, with the help of a different set of connecting symbols :

<i>Type of Inter-Subject Phase Relation</i>	<i>Connecting Symbol used in CC</i>
(i) General Relation Phase	Oa
(ii) Bias Phase	Ob
(iii) Comparison Phase	Oc
(iv) Difference Phase	Od
(v) Influence Phase	Og

The relation phase in DC up to the 14th edition was indicated through the symbols 00 and 0001. But its editors decided to eliminate these provisions, in 15th and 16th editions. By dropping out this provision the DC editors have deprived its notation of hospitality in chain. In DC certain persons feel that the symbol 09 which says 'we will now divide geographically' and 0 which stands for 'the division by form' is identical to inter-subject phase relation. But 09 is Geography facet (not a phase) and 0 is for the common isolates under classes and thus be considered under one Basic class. Therefore, they do not deal with a complex class for which this phase relation is needed. Previously, Ranganathan used the term Tool Phase in his Fundamentals, thinking that it deals with complex specific subjects. But later on he recognised that the tool phase is nothing but the application of posteriorising Energy Common Isolates.

UDC also provides for phase relation in its notation but facet and phase do not have separate existence there. They have been put together. Vickery has examined the question of various types of phase relations. DC files

such classes under the class of its utility. As the concept of the utility of a complex specific subject, as against the 'subject matter of it, is a vague statement, one may expect that the future editions of DC may reintroduce the concept of Phase Relation in its notation.

(e) **Intra-Facet Phase Relation Device** : Inter-relation between the isolates of a facet a in main class is known as intra-facet-phase relation. The types of relations are the same as in case of Inter-subject Phases. Eexamples are given below :

<i>Specific subject</i>	<i>Type of intrafacet phase relation.</i>
(i) Influence of Morphology on Physiology.	Influence
(ii) Ecology compared to Genetics	Comparison
(iii) Relation between Secondary and University Education.	General
(iv) Difference between Physical and Mathematical Geography	Difference
(v) Physiological anatomy	Bias

Documents on above types of relations are not difficult to be found in any library. The practice is that they are classified in a 'somehow manner'. Because many schemes of classification have not provided for the individualisation of this phenomenon of the universe of knowledge in their notation. CC is the only scheme which provides for the individualisation of such relations in its notation.

(f) **Intra-Array Phase Relation Device** : Intra-array phase relation means relation between the sub-isolates in an array. This array is not the array of the main classes for which inter-subject phase relation has been prescribed P_c , nor it is the array of PMEST where facet analysis is valid. It is also not the relation between the isolates of a facet (e.g. E of Biology will have 1 2 3 4 5 6 7 8 isolates) because here the intra-facet phase relation has been recognised. Then, where are the intra-

array phase relations applicable ? They are applicable at the level of the array of sub-isolates which are the divisions of one isolate of a facet in a main class ; for example :

- (i) Sociology is a Main Class ;
- (ii) Group is personality facet in the main class ;
- (iii) Group got by residence is an isolate in the personality facet ;
- (iv) Sub-isolates like rural, urban and city groups, etc., are the divisions of the isolate by 'residence' which is a part of [P] of the Main class.

So, intra array-phase relation means relation between the sub-isolates ; which occur under the isolates of a facet. Example for colon number :

Y31 Ow5— Difference between the rural folk and city folk.

Y Main class=Sociology
Personality=Group

Y3 An isolate of [P] by residence

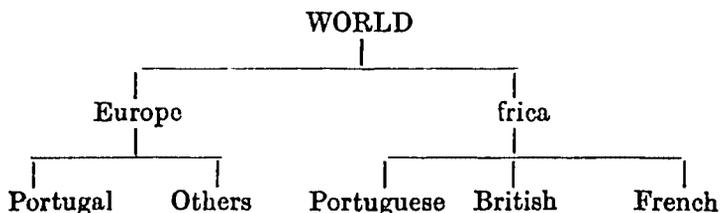
Y31 a sub-isolate of 'by residence' of [P] of Y standing for Rural folk.

Y35 a sub-isolate of 'by residence of [P] of Y standing for City folk.

CC has provided for this type of relation in its 6th edition. But a very wide term, *i.e.*, 'Intra-array phase relation' is used for it ; because the arrays of different orders have their own types of phrase relations. The possibility of giving a specific term to this phenomenon may, therefore, be investigated. It is possible that the term 'Intra-isolate phase relation' be a better term. If so, it may replace the term 'intra-array phase relation'.

Super-imposition Device : When two separately scheduled isolates enumerated in an array appear in a specific subject,

one subordinate to another, it is said to be a super-imposed situation. This happens when there is a mutual denudation between two isolates in a facet. Suppose a specific subject like 'History of Portuguese Africa' is to be individualised. The position will be as follows :



When we say 'Portuguese Africa', we mean the class Africa to be sub-divided by Portugal, an isolate under Europe. Therefore, such situations can be controlled in the following manner so long the colonies exist :

<i>Specific Subjects</i>	<i>Translation in Colon</i>
History ÷ Africa ÷ Portugal	V6-542
History ÷ Africa ÷ Britain	V6-56
History ÷ Africa ÷ France	V6-53

A scheme of classification should be able to translate such specific subjects through its notation. CC has examined the question in detail and has worked out certain rules for it. The connecting symbol used for it is '-' hyphen. An intelligible sequence between the isolates should be maintained. Suppose we use the sequence V542-6 (because value of digit 5 is lesser than the value of digit 6) it will mean 'History of African Portugal'—a thing which does not exist; hence it is unintelligible. This device is of great help for hospitality in chain in the notation DC has provided for these specific subjects in an enumerative way, under 966·57, 967·3 and 967·9 for Portuguese Guinea, Angola and Mozambique, respectively. A number for Portuguese Africa is however, not available in DC.

History of Africa

The concept of hospitality had always been dear to the leaders in Library Classification. Melvil Dewey insisted on it and introduced the Decimal Fraction. Bliss cried for 'Expansibility and adjustable co-relation in notation'. Cutter also coined the slogan 'Expansibility'. Richardson demanded 'indefinite expansion'. Sayers told each of his students, "Hospitality of a notation is its essential feature for without it a scheme is soon exhausted." Ranganathan examined the entire issue of hospitality in notation. He provided for an all round hospitality to CC notation. Really speaking, the entire history of library classification and its development shows nothing but the struggle for hospitality in notation at various points.

PART III

ON

TERMINOLOGY AND NOTATION

“The schedules are for classifiers, and the classifiers should be masters of terminology.”

H E BLISS

“The notation does not make a classification, but it may mar it.”

H E BLISS

Principles of Terminology

Ideas are expressed in words and sentences. All ideas are given names in languages used in the world. Sun is an entity. If one person wants to tell another person something about the sun, he may either point out his finger towards the sun during the day time and make the other man see it or he should use his tongue to pronounce the name given to the sun in a language which both know. The sun (which is an English word for the entity concerned) is known to non-English speaking world through different words. In Japanese, Chinese, Indian and other languages, the words to represent the entity sun will be different. In the same manner the wooden structure over which we sit, and where the seating space is often about one and a half feet above the surface of the floor, is known by the name of 'chair' in English language. Different languages will have different names for the entity which is known as chair in English. The classes which are known by the terms Chemistry, Sociology, etc., in English are known by different terms in other languages; for example, in Hindi language their names are Rasayan Shastra and Samaj Shastra, respectively. Whatever terms in different languages may be used to denote a particular entity, the entity will be the same in the idea plane. To make an entity understandable to another man, words of a language are used. Similarly, in the field of classification of knowledge embodied in documents, all entities must be translated into a language, which may be English, French, German or any other. This means that the entities are represented by the words of a language. In the schedules of a classification words and terms are used to denote the respective entities. The languages used by

men all the world over are not perfect. Some vagaries are associated with each language. There is no at-onement between one entity and its translation into only one word. The result is that for one thing there may be two or more words in a language ; or one word may represent two or more entities. Besides this difficulty, we often come across cases of suitable words not existing in a language to represent a particular entity, for which new words are to be coined. We are concerned with these phenomena of a language, because while making a schedule we must assign a word or term to one and all the entities ; and we should see with great care that the term which we assign to one entity does not have two or more meanings. Ranganathan uses the term language plane for the problems of this area. Sayers¹ has explained the process of conversion from idea plane to the language plane in the following words :

“A schedule of classification is a written statement of a classification which has already been formed in the mind of its maker (classificationist). It is, as it were, in the first place a mental map of the whole of knowledge or of some part of it and this map is transcribed in words or *terms*.”

In short, terms in schedules of a classification, are the names given by the classificationist to denote the main classes, facets, isolates and sub-isolates etc. The purpose of giving names is that they should properly represent current meanings of different orders of classes. There are five principles to guide us in the selection of terms to be used in schedules :

- (i) Canon of Currency ;
- (ii) Canon of Reticence ;
- (iii) Canon of Enumeration ;
- (iv) Canon of Context ; and
- (v) Canon of Consistent use of Terms.

1 Sayers (W C B) : Introduction to Library Classification, p. 21.

(i) **Canon of Currency.** Terms used in a scheme of classification should be in current use among the specialists of that area. This is the Canon of Currency. Terms used in a class often change. An old term may become obsolete and is thus replaced by a new one. In order to cope with this phenomenon, a scheme should see that it only adopts those terms which are current at the time of the construction of the scheme. As there is no certainty that a term once adopted will not become obsolete, terms in a scheme should be replaced in its subsequent editions if the need be. Once upon a time, the term Natural Philosophy was used to denote what we now understand by the term Science. The implication of this canon is that a scheme of classification which is in use in the 20th Century should adopt the term Science and not the term Natural Philosophy.

In DC, we find that the terms used are often unsuitable. So is the case with CC. In the present day world of specialists, every day new terms are coined. In DC the scope notes often explain the terms used and in addition to it, the relative index of about 2,500 pages also helps. In CC, one finds only basic terms enumerated under facets and their fusion depends on the classifier. In DC the use of terms is often confusing. For example, Religion and Theology are two different terms. In schedule, 200 has been assigned to Religion. In the index, Theology has been referred to 200. Again, 200 as Religion stands for a main class covering all religions, but in index the Christian religion is given 200. In the index Christian Theology is given 241. The loose use of terms in this manner creates a doubtful situation for classifiers. The practice in CC, to use only basic terms is often troublesome to the classifier in making out a new term. This indicates that if DC suffers from over explanation of the terms in its schedules and in its index, CC has the drawback of under explanation of terms in its schedules and in its index. Here one should agree with Palmer and Wells², when they say that all classifi-

² Palmer and Wells; Fundamentals of Library Classification, p. 46.

cationists have great difficulty in finding unambiguous terms. This also means that the decision of what is the most current term among the specialists is not always a simple affair. Two terms meaning the same idea may be equally current with the specialists. Whatever be the difficulties in the selection of current terms, the value of the canon is indisputable. Whether or not the classificationist manages to provide most current terms at all the places, the fact remains that they always make an attempt to do so.

(ii) **Canon of Reticence.** This canon meets the requirements of a gentleman. It says that the terms used in a scheme of classification should not be critical and indecent. All schemes of classification should observe this canon. This canon can best be observed if the classificationist prefers to use only descriptive terms and not the ratiocinative terms.

Ranganathan feels that the use of the term Minor Authors in DC is against the canon of Reticence. It is true that the valuation of authors changes, yet distinction exists between the major and minor authors. The classificationist need not apply his judgment in deciding about an author as a major or minor one. The society and the circle of academicians in a subject decide the status of an author. If such a term is used by the classificationist for less known authors, it is not to be taken as the violation of this canon. If in a century one out of about 50 authors becomes a major author and he is found listed under minor authors, the scheme should arrange to change his status in its new editions.

Still there is a justification when Ranganathan says that the use of the term minor authors in DC is a violation of the Canon of Reticence. It is so, because the method used in CC to individualise authors is not at all ratiocinative nor does it require any application on classificationists' part, of his judgment on the authors' status. In CC, authors are individualised in a purely descriptive manner with the help of the year of the birth of the author (chronological device).

(iii) **Canon of Enumeration.** The canon of Enumeration means that scope, meaning and denotation of each term used (in higher orders) in the schedule should be determined by examining the sub-terms used under it at its different chains (in lower orders). For example, we take the term *Philosophy* used in CC and DC. The meaning, scope and denotation of the term *Philosophy* in CC and DC depends on what classes are included under it in the respective schemes. In DC, *Philosophy* also includes *Psychology*, but in CC we do not find *Psychology* under the head *Philosophy*. So, the denotation of the term *Philosophy* in DC includes, in addition to other classes, *Psychology*; and the denotation of the same term, *Philosophy*, in CC does not include *Psychology*. This kind of variation is bound to exist in different schemes of classification because it is impossible to have a universal agreement on the scope of terms of classes.

The implication of this canon is that no uniformity be expected by the use of a term in different schemes, because the scope of the term may have been viewed differently by different schemes. Therefore, while deciding the denotation of a term, the lower links of that term should be examined. Hence, the traditional question of the observation or violation of this canon, like other canons, does not generally arise. But in one respect where it imposes a kind of control on the classificationist, is that while enumerating the lower links of a term it should be seen that no unconnected sub-terms are used under it. The above explanation can be summed up in the following two points :

1 The denotation of the term *Philosophy* in DC, in addition to *Logic*, *Ethics*, *Metaphysics*, etc., covers *Psychology*; in CC it excludes *Psychology*. The canon guides us in interpreting the scope of the term *Philosophy* in a scheme by examining the sub-terms used. There is no question of the observation or violation of this canon.

2 As the denotation of the term *Philosophy* will be understood by examining the sub-terms used under it, this canon demands that the classificationist should not use a sub-term, which does not fall under a class. This means

that DC should not have put the term Psychology under Philosophy. It is only in this respect that the practice followed in DC violates the canon.

The canon is more relevant in the first sense mentioned above. It is only in a casual manner that the second point comes in the picture.

(iv) **Canon of Context.** What the Canon of Enumeration demands about the meaning of the terms of higher order, the Canon of Context prescribes the same for the meaning of the terms (or sub-terms will be better) of the lower order. The need for this canon arises because one sub-term is found under a number of classes. Whenever such a term finds a place in a document, the question arises as to under which of the many classes where it is enumerated (or available), it should go. For example, the term 'Metal' is common to Building Engineering, Money in Economics, Economic Geology, and Inorganic Chemistry etc. A document on metals can go to any of these classes. But its place will be decided by examining the context in which it is used. If it has been used in the context of Building it will go there ; if it is used in the context of Inorganic Chemistry, it should be placed under Chemistry. This is the way to apply this canon in practical classification. Nevertheless the canon is of equal importance in the use of terms to be assigned to entities in schedule making by the classificationist. Here, it means that while assigning terms to entities and while interpreting them, the terms used for entities at upper links should be borne in mind. Suppose the class Biology is to be assigned its sub-terms. In DC and in CC the following terms have been used :

<i>DC</i>	<i>BIOLOGY</i>	<i>CC</i>
574		<i>G</i>
Bio-Physiology		Physiology
Bio-morphology		Morphology
Bio-Ecology		Ecology

The terms Physiology, Morphology and Ecology etc. under the class Biology, will always be taken as the divi-

sions under Biology. No chances exist for these to be taken as the divisions of Medicine or Zoology, etc. Hence, it is not necessary for DC to add the term 'Bio' to these subclasses. To do so will be a violation of this canon. One can see that CC has not used the term 'Bio', which is implied in case of all these divisions. Here CC observes this canon.

(v) **Canon of Consistent use of Terms.** This canon means that for similar entities same terms should be assigned, if such entities occur at more than one place in a scheme of classification. To this Sayers³ says, "*Terms in a classification, must be used consistently.*" For example, the ideas implied by the term Pathology occur at a number of places—animal pathology, plant pathology, social pathology, etc. The canon demands that under all such classes the term Pathology should be used in the schedule and no other term having the same meaning should be used. If different terms giving the same meaning are used at different places, it will violate the canon of consistent use of Terms. CC and DC both observe this canon, for example, by using the term Pathology under many classes. Like this, many examples will be found in DC and in CC.

One finds that Ranganathan has not used this fifth canon for terms in his *Prolegomena*. But he certainly means to use it implicitly, because the concept of consistency is dear to him and he has mentioned it in case of principles for arrays and characteristics.

Notation

(a) **Definition.** Notation is a system of signs or symbols coined for a specific purpose. For classification of knowledge embodied in documents, we have already discussed that the entities in knowledge are given names or assigned terms in a natural language. But this is only the half way. The second half involves the translation of terms into a notation. If the entities are translated into the terms of a natural language; the terms are

³ Sayers (W C B): Introduction to Library Classification, p. 25.

translated into a notation, which is an artificial language. Ranganathan⁴ defines notation as a system of ordinal numbers used to represent the classes in a scheme of classification. Bliss defined notation as "a system of marks or symbols in some order denoting terms or members of a series or system of things". Mann⁵ gives a very short definition: "The symbol which stands for the classes and their sub-divisions is called the notation of that scheme." She soon banks upon Sayers and quotes him, "A book notation... is a short-hand sign standing for the name of a term and forming a convenient means of reference to the arrangement of our classification."

On the role of Notation, Mann agrees that it is an important addition to any classification schedule but at the same time she feels that the notation should in no manner determine the logic, scope or development of classification. Mann underestimated the value of notation. The notation must be able to maintain the logic of classification if not to determine it; it must also be able to represent the scope of classification; and be in a position to develop at par with the development of classification. Sayers⁶ has defined, "A notation is a series of symbols, or short-hand signs—perhaps 'short signs' would be more accurate—for the terms in classification... and which in their arrangement show the arrangement of classification". Here Sayers rightly demands that the structure of a notation should be able to reveal the arrangement of classification. Palmer and Wells⁷ define it in following words: "Notation is a device for mechanising arrangement and must be composed of written symbols whose order is defined." Their expectation that the notation should mechanise the arrangement is the proper duty that they assign to it. To Phillips, a notation is a series of symbols

4 Ranganathan (S R): *Prolegomena to Library Classification*, p. 85.

5 Mann (Margaret): *Introduction to Cataloguing and the Classification of Books*, p. 44.

6 Sayers (W C B): *Introduction to Library Classification*, p. 53.

7 Palmer and Wells: *Fundamentals of Library Classification*, p. 60.

which stand for the names of a class or any division or sub-division of a class and forms a convenient means of reference to the arrangement of a classification.

In the light of the above definitions, one can conclude that notation is an artificial language. It should be scientifically and comprehensively built so that the translation of the kernels of a natural language is possible in it.

(b) **Need for and functions of Notation.** The very fact that the terms used in the classification of knowledge are to be translated into ordinal numbers, reveals the basic need for notation. In addition, the following are other reasons for which notation is needed :

- ✓1 Notation is required to replace the terms. It becomes a permanent symbol through which the terms of classification are referred to.
- ✓2 It is a medium of and guide to the sequence of terms and fixes their relative position.
- 3 Alphabetical index is possible only through notation.
- ✓4 It is written on various parts of documents and cards etc.
- ✓5 It helps in the arrangement of documents on the shelves and the entries in the catalogue.
- ✓6 Efficient working of the catalogue is dependent on notation.
- ✓7 It figures among the guides used in a library.
- 8 It shows the sequence and the subordination and coordination of classes.
- ✓9 It shows various types of phase relations between classes, facets, isolates, etc., and differentiates between the facets of a class and between the types of relations,

- ✓10 It arranges entries in bibliographies and lists, etc.
- ✓11 It restores the sequence of documents, if they are pulled out from their respective places.
- ✓12 One can determine the specific subject through notation without reading the text.
- ✓13 Facilitates the use of mnemonics.
- ✓14 It is used for author marks, book numbers and sequence numbers, etc.
- ✓15 It is used for charging and discharging of documents, etc.

In short, as Mills⁸ says, the vital function of notation is to mechanically maintain the sequence of subjects by giving each term a symbol possessing an agreed ordinal value. The combination of various symbols does the whole job by synthesising various facets etc. of classes, and individualising the specific subjects thereby.

(c) **Types of Notation.** Broadly speaking, the notation is of two types : (1) Pure Notation, and (2) Mixed Notation. It is a pure notation if only one kind of symbol is used. If more than one kind of symbols are used, it is known as a mixed notation.

Examples

1 Pure Notation : (a) 1 2 3 4 5 6 7 8 9

Or

(b) A B C D E F G H I
J K L M N O P Q R
S T U V W X Y Z

2 Mixed Notation : 1 2 3 4 5 6 7 8 9 and A B C D
(Two or more than E F G H I J K L M N O P Q
two of these species R S T U V W X Y Z and , ; :
of digits). . ' — and a b c d e f g h i j k
l m n o p q r s t u v w x y z
and others.

8 Mills (J) : Modern Outlines of Library Classification, p. 66.

There was a time when pure notation was very popular. Melvil Dewey used it in his Decimal Classification wherein he adopted only the figures. Cutters used it in his Expansive Classification by adopting only the letters. Sayers went to the extent of prescribing a canon of Pure Notation which all schemes must adopt. However, it was soon realised that pure notation fails to work. Richardson was one of the leaders to raise an objection to pure notation. His ideal was the mixed notation, using both the figures and the letters. Bliss⁹ also suggested that the notation should combine letters and figures as simply as is compatible with the requisites. It is because of the demands made by Richardson and Bliss that the reasonable Sayers gave up the cause of pure notation and became an advocate of the mixed notation. Richardson went to the extent of prognosticating that every practical system sooner or later will have to adopt a mixed notation.

When the time came for Ranganathan, he used various types of digits in his Colon and included a canon of Mixed Notation in his *Prolegomena*. Really speaking, the mixed notation became a necessity due to the dynamic growth in the field of knowledge and its complex formations in documents. To some extent the mixed notation deprived a scheme of its simplicity. As choice was between the workability and simplicity, it was obvious that workability be preferred. The advantage was the flexibility of notation. Today, even the DC, the chief supporter of pure notation has adopted mixed notation by including capital letters. Therefore, the concept of pure notation has only a historical value, where it remains a stage of development and the predecessor of mixed notation.

(d) **Qualities of Notation.** The question of qualities of notation arises only in the event of a comparison between good and bad notations; and it means those features which make a good scheme of classification. This leads to the determination of what services a notation

⁹ Bliss (H E) : *Organisation of Knowledge in Libraries*, p. 71.

should perform in order to become a good classification. If we examine the above in another way, we find that a good classification scheme is one in which it is possible to individualise each document. This is possible when the notation is versatile enough to have an equal for each feature of knowledge and its various types of formations and expositions. Features which go to make a notation versatile should, therefore, be taken as the qualities of notation. All of us will agree that the notation 301 (three hundred and one) is simpler than 0.301 (decimal three zero one). Melvil Dewey was forced to reject the simpler number and to adopt the less simple (but more versatile) one in his Decimal Classification. Why was he forced to do so? The answer is that it was impossible for integral notation (the simpler one) to deliver the goods in the classification of documents. It was then possible to do so through the versatile decimal notation (comparatively more complicated). Knowing this situation very well, the genius of Bliss said, "The notation should be as simple as is feasible." To sum up, the qualities of a notation are those features which make it a versatile notation.

To Sayers, the qualities of a notation are : (i) brevity ; (ii) simplicity ; (iii) flexibility ; and (iv) mnemonic. Bliss prescribed that the notation be expansive with adjustable correlation as short as is feasible ; mnemonics should be casual and systematic and it should be as simple as is feasible. These are perhaps the first set of qualities demanded of notation. The second set of qualities are :

- 1 It should be easy to write.
- 2 It should be easy to remember.
- 3 It should be more commonly used.
- 4 It should be easy to communicate.

A notation should have all these qualities but not at the cost of its basic quality, *i.e.*, capacity to reveal the features, formations and expositions of knowledge. This

means that notation should be versatile as against being rigid. This is the primary quality and whatever else is possible should be maintained. Ranganathan demands the following qualities in a notation :

- 1 It should be hospitable to new topics in its arrays and chains ;
- 2 Synthesis should be possible in it ;
- 3 Its expressiveness be maintained ;
- 4 Its length should be relative to the depth of the class it represents ; and
- 5 It should be mnemonic in its structure.

(e) **Structure of Notation.** Notation is made up of digits. A digit is a single symbol in a notation. The total number of digits in a notation is its base. The mode of arrangement of digits according to Ranganathan is possible in the following ways :

- 1 The digits can be arranged in a straight line, it is known as the Linear structure of notation.
- 2 The digits can be arranged in a horizontal straight line ; it is known as Horizontal structure of notation. It can be of two types :
 - (a) The digits can be arranged from left to right in a horizontal line, it is known as the Right handed notation.
 - (b) The digits can be arranged from right to left in a horizontal line ; it is known as the Left handed notation.
- 3 The digits can be arranged in a vertical straight line; it is known as the Vertical notation. This can

be of two types :

- (a) Downward vertical line notation.
 - (b) Upward vertical line notation.
- 4 When the digits are arranged along a curve, it is known as the Curved notation.
 - 5 When the digits are arranged in two dimensions, it is known as Plane notation.

The structure of notation used in classification of knowledge embodied in documents is often the Right-Handed Linear Notation. There are two types of notations for place values :

- 1 Integral notation.
- 2 Decimal fraction notation.

(f) **Canons for Notation.** Besides the canon of mnemonics, Ranganathan has suggested three canons which a notation should observe. If we include the canon of mnemonics for notation it will make the following four canons :

- 1 Canon of Relativity ;
- 2 Canon of Expressiveness ;
- 3 Canon of Mixed Notation ; and
- 4 Canon of Mnemonics.

(i) **Canon of Relativity.** It demands that the length of notation in a scheme should be according to the size of a specific subject which is to be translated in the notation. This means that a class of greater extension should be individualised by lesser number of digits, and a class of lesser extension should be individualised by greater number of digits. The number of digits should be in relation with the size of the class. Because the process of division in classification is from the higher class to a lower class, it is obvious that the higher classes will require less

number of digits and the lower classes will require greater number of digits :

Example

DC No.	No. of Digits	Class		CC No.	No. of Digits
		Order	Subject		
<u>100</u>	3	0	Philosophy	<u>R</u>	1
<u>160</u>	3	1	Logic	<u>R1</u>	2
<u>161</u>	3	2	Inductive Logic	<u>R11</u>	3

We find that 3 digits have been used for orders 0, 1 and 2 in DC. In CC the number of digits used for order 0 is 1, for order 1 is 2 and for order 2 is 3. Here CC observes the canon while DC violates it.

(ii) **Canon of Expressiveness.** It means that each digit in a class number should express the characteristic it represents. Its applications are that no digit should be without a meaning and that each characteristic in the line of division should be represented by a digit of its own in successive sequences. Let us examine the following class numbers in DC and CC :

(a) 621·433

- 6 —Technology
- 62 —Engineering
- 621 —Mechanical Engineering
- 621·4 —Prime Movers
- 621·43 —Internal Combustion Engine
- 621·433 —Gas Turbine Engine

Here each digit in DC expresses one characteristic in the hierarchy from technology to gas turbine engine.

(b) L21431

L — Medicine
 L2 — Digestive System
 L21 — Mouth
 L214 — Tooth
 L2143 — Kinds of Teeth
 L21431 — Milk Teeth

Here each digit in CC expresses one characteristic in the process of division from medicine to milk teeth. Both CC and DC observe this canon in these examples. The expressiveness of notation is necessary because it helps the user to follow the structure of knowledge and process of its classification.

(iii) **Canon of Mixed Notation.** This canon demands that the notation of a scheme should always be a mixed notation. We have already discussed the advantages of mixed notation under 'types of notation'. Here it may be stated that no scheme will be efficient if it fails to adopt the mixed notation.

(iv) **Canon of Mnemonics.** There is another canon which falls under the area of notation. It is the canon of Mnemonics. Because it has a bearing on the entire scheme of classification, Ranganathan has discussed it under the general canons. We may take up this canon under notation itself.

The Canon of Mnemonics demands that a particular digit should represent the same or similar ideas under different main classes where they occur. Bliss¹⁰ says on the value of mnemonics, "Notation as a kind of symbolical language depends extensively on memory of meanings."

¹⁰ Bliss (H E): Organisation of Knowledge in Libraries, p. 58.

The term mnemonics means an aid to memory. The notation should be used in such a manner that similar idea gets the similar number. This will be an aid to memory.

For mnemonic qualities of notation, Ranganathan has expounded three canons :

- (i) Verbal Mnemonics ;
- (ii) Scheduled Mnemonics ; and
- (iii) Seminal Mnemonics.

(i) **Verbal Mnemonics** means that the alphabets used in a notation may also be taken to represent the words. The first alphabet of the word will stand for the entire word. Suppose U stands for Useful Arts in a scheme of classification or C stands for Chemistry, these are the verbal mnemonics. Bliss gave the name 'literal mnemonics' to this principle. Knowing the phenomenon of its rare occurrence, he said that literal mnemonics be casual. Ranganathan suggests that verbal mnemonics should not be adopted if a sequence more helpful —and of logical systematic order—can be maintained otherwise. Accordingly, the Alphabetical Device is used as a last resort. Both in DC and CC we find that the Alphabetical Device is applied rarely.

(ii) **Scheduled Mnemonics.** Scheduled mnemonics demand that similar digits should be assigned to similar classes and terms, if they occur under more than one class. What the Canon of Consistency demands in case of an arrangement of entities in an array, and what the Canon of Consistent use of the terms demands in case of assignment of terms to entities ; the same is demanded by the Canon of Scheduled Mnemonics in the allotment of digits, in notation, to similar terms. For example, in DC and CC the same digits are assigned to terms Poetry, Prose, Drama, etc., in all literature. In DC the same form division numbers are used irrespective of the class. In Colon the Common Isolate

numbers get the same digits in different classes. In addition to these, in CC, we find that the use of instructions "same as in class so and so" fulfils the canon of scheduled mnemonics to some extent. Following are the examples of scheduled mnemonics in CC and DC :

DC No.	Class	CC No.
574·5	Ecology	G : 5
598·5	Animal Ecology	K : 5
598·25	Birds Ecology	K96 : 5
581·5	Plant Ecology	I : 5

In the above examples we find that the term Ecology has been represented by the digit 5 under different main classes. This is due to the observation of this canon.

The following examples show the violation of this canon in DC :

DC No.	Class	CC No.
574·1	Physiology	G : 3
591·1	Animal Physiology	K : 3
598·21	Bird Physiology	K96 : 3
574·876	Cell Physiology	G11 : 3
612	Human Physiology	L : 3

In DC we find that in the first three classes, digit 1 has been used for Physiology ; in the fourth class digit 6 has been used to represent Physiology and in case of the last class, digit 2 has been used. In CC we find that under all places digit 3 has been used. CC is able to satisfy this canon because of the Facet Device, Common Isolate Device, Geographical Device, Chronological Device, and Subject and Phase Relations Devices. In DC, instructions

like 'divided like' and 'form division' help in observing this canon.

(iii) **Seminal Mnemonics.** Previously Ranganathan used to denote this concept by the term *Unscheduled Mnemonics*. On the suggestion of A J Wells he changed over to *Seminal Mnemonics*. This canon demands that the *seminally equivalent* entities be allotted the same digit in the subjects where they occur. The question arises as what are the *seminally equivalent* entities? It is often difficult for a common man to identify seminal equivalence between various ideas in subjects. But at the same time it is not impossible. There is a lot of unity found in various basic classes in the universe of knowledge. This can be termed as unity in knowledge. This means that there are basically identical ideas, but they do not possess the same terms in different main classes. That such ideas should get the same digit in notation is the implication of this canon. For example :

Function in Political Science ; Physiology in Biological Sciences ; Syntax in Linguistics ; and Social activities in Sociology—all represent the ideas which are *seminally identical*, though they mean different things in different classes. In Colon (p. 132) Ranganathan has enumerated the seminal meanings of different digits. To digit 5 he assigns following sub-groups of ideas :

The digit 5 is used as mnemonic for :

- (a) Energy, light, radiation, organic, liquid, water, ocean ;
- (b) Foreign land, alien, external ;
- (c) Environment, ecology ;
- (d) Emotion, foliage, aesthetics, woman, sex, crime, etc.

Let us examine the above from two angles. One, as far as the isolates within one sub-group are concerned, it is

certain that they have seminal equivalence with each other. Light is energy, radiation is also connected with light and is energy, water is liquid and both are energy and ocean contains water etc., etc.

Second, but how far Energy isolates – alien and women belonging to different sub-groups are connected with each other? It is often difficult to find seminal equivalence between the isolates of these different sub-groups, but as already mentioned, it is not impossible. For example, woman is energy, she keeps the world going, generation after generation, she is also alien in the sense that after marriage she goes to the so-called foreign place, and until she is married, she remains external to the family where she is to live. Well, such arguments may appeal but one cannot deny the fact that it is difficult to recognise seminal equivalence between the various isolates unless a man is much enlightened. At the same time, it does not mean that what a common man does not know, does not exist.

Development of Notation. Present day classification and its notation has plunged into the areas where classificationists like Melvil Dewey, Bliss and Sayers would have feared to tread. The question arises how did it get this way? Let us peep into its lineage and heritage, perhaps we may find some clue. This much is sure that modern classification did not conjure forth itself phoenix like, nor has it sprung like Athena full grown out of the writings of Ranganathan, Vickery, etc. Its birth originated in the scholars' desire to classify and identify. Its development is parallel to the proliferation of knowledge. Its versatility is, no doubt, a result of Ranganathan's single-minded devotion, scientific thinking and analysis. The classifiers all over the world have given thought to the present structure of notation. Appreciations and rejections have been the obvious results.

The development of notational techniques can be categorised into the following :

- 1 Ancient era *i.e.*, classification without notation,

2 Medieval era, *i.e.*, classification with rigid and semi-flexible notation.

3 Modern era, *i.e.*, classification with flexible and versatile notation.

1 Classification without Notation. Before the dawn of the 18th Century, there was no notation, worth its name, attached to the library classification. The reasons were :

(i) Extension of the specific subjects was still at the broader level.

(ii) Clientele of the library was limited to a selected few, and they were the cream of the intellectual community. They never required any mechanization and could have their way through their encyclopaedic knowledge.

(iii) Libraries and librarians were not feeling the pressure of full grown democracy which gave birth to the concept, Books for all.

It was at this stage that notation was in the clutches of alphabetisation and the use of non-decimal arabic numbers. Really speaking, there was no need for minute classification or for notation at that time.

2 Classification with Rigid and Semi-flexible Notation. The 19th Century brought in its wake many new philosophies. Concept of democracy had already established its roots and slogans for universal education were shouted with great zeal by the utilitarian school and by others. Industrialisation had started paying dividends. The learned bodies which had originated in the 16th Century in the Renaissance Italy and had spread across Europe in the 17th and 18th Centuries had established homes in the American and Asian continents in the 19th and 20th Centuries. These learned bodies were engaged in the diffusion of knowledge. The population pressure was being felt and fears of the Malthusian theory were gaining currency in the growing population areas of the world. To allay these fears, multiplication of human resources was necessary. Opportunities of self-government, development of industries and many other factors made it necessary for a

man to learn and know his rights and duties. It was at this stage that Melvil Dewey who had felt the necessity of the organisation of documents in a library in a helpful sequence, liberated library classification from the clutches of alphabetisation. His logic was : Why should we not make use of the Decimal Notation for enumerating the branches of knowledge and their sub-divisions and thus give a helpful organisation to the documents in a library ? Here emerged the first important feature of Notation which provided for hospitality although only in one direction.

Deweys' Contribution. Dewey was ridiculed for his invention. *Albiet*, the librarians all over the world adopted the decimal classification and those who had not adopted it by the end of the 19th Century had to bear the curse of Lord Rayleigh¹¹ who said in 1884, "In science by a fiction as remarkable as any to be found in law, what had been published, even though it be in the Russian language, is spoken of as known, and it is too often forgotten that the rediscovery in the library may be a more difficult and uncertain process than the first discovery in the laboratory." This was a challenge to the library profession, denouncing the very existence of the creatures known as librarians. If we examine the state of knowledge in the last quarter of the 19th Century, we find that the proliferation of knowledge had started although not with a dynamic speed. The librarians found refuge in Dewey's Decimal classification which worked well, rather very well in the organisation of documents etc. The retrieval of documents was well in control.

But the dynamic growth of knowledge was not going to stop, it progressed towards a greater intensiveness and documents dealing with the subjects of lesser and lesser extension had started coming up. The most powerful and ever alive gift of Melvil Dewey to the science of classification in securing hospitality of notation by decimal device had started feeling its inability against the dynamic growth of knowledge and its tactics. By the end of the 19th Century the librarians had almost lost their faith in the utility of

11 Vickery (B C) : Classification and Indexing in Science, p. v.

classification in general and Decimal Classification in particular, as far as the individualisation of the documents was concerned.

Emergence of UDC Notation. The urge for helpful organisation of documents and articles in periodicals and their rapid increase every year and the desire to keep track of this flood, made Henri La Fontaine and Paul Otlet to convene an International Bibliographical Conference in Brussels in 1895. This conference gave birth to International Institute of Bibliography (IIB) which sponsored the Universal Decimal Classification. This new scheme of classification primarily based on the structure of Decimal Classification had certain new features. Loyalties towards the concept of pure notation had to be given up in order to represent the exposition of intensified knowledge in documents which were coming up at that time.

The inter-relation between the various sub-divisions of a specific field of study had already become the focus of the academicians in the various branches of knowledge. In order to individualise several types of relations and manifestations of subjects, UDC did not hesitate in providing for a number of connecting symbols and several auxiliary tables. The mixed notation became a must and necessary amendments had to be made in the classificatory thought which was favouring pure notation. However, one would agree with Rangana- than that the greatest weakness of UDC was the adoption of the rigid DC core which has not only clipped the wings of the UDC in the design of its numbers but has also prevented it from providing for techniques like unscheduled mnemonics, etc. It has also fallen a prey to synonyms. Its extravagant use of numbers in representing various relations made it very expensive in its notation. But nobody can deny that UDC's associations with Decimal Classification showed a new way of representing the relations between the various units of thought without any limitation to the occurrence of an isolate idea under a different field of study.

From the historical angle the invention of DC and UDC could be grouped under the era of classification with rigid notation. One would be right in saying that UDC also belongs to the era of classification with notation but with semi-flexibility.

3 Classification with Flexible and Versatile Notation.

At a time when DC and UDC, separately as well as jointly, were struggling to win over the peculiarities in the trend of the universe of knowledge, which was proceeding towards greater minute specialisation, along with multiplication and inter-relatedness of various subjects of different orders, their rigid core was disappointing so far as the individualisation of such subjects was concerned.

By this time Library Classification had undergone a scientific treatment at the hands of Bliss, Richardson, Hulme and Sayers, etc. Sayers had worked out certain principles for the construction of the schedules of library classification. It was with this background that Ranganathan entered into the field of Library Classification and gave a scientific shape to the discipline. His first and the greatest contribution was the invention of the categories under many fields of study. However, it was not the last contribution. He provided for different connecting symbols. Provision in Notation to indicate inter-subject, intra-facet, and intra-array phase relations, and super-imposed situations, etc., made the notation richer. Enormous hospitality in Arrays and Chains of the notation was introduced. All these have made a versatile notation, capable of meeting any challenge from the universe of knowledge.

Versatile Notation. The importance of notation in a scheme of classification was very much established even before Ranganathan. The mixed notation was the only alternative to strengthen the hands of a classificationist. The number of species in a mixed notation developed gradually. Ranganathan had started with three species, but Colon Classification has four at present. Mixed notation

has served well to the requirements of the translation of ideas into numbers. Gradually, the numbers developed into the shape of a semi-language which has been called the 'artificial language of ordinal numbers' by Rangana-
than.

Apart from many contributions of the mixed notation the most important one is the concept of Zone Analysis. One can safely say that it is a by-product of mixed notation. The peculiarity of the zone analysis is the provision of hospitality in an array of any order. This peculiarity has made knowledge classification a living force and is one of the greatest counter-tactics at the command of a classificationist in his struggle with the tactics of the universe of knowledge. The justification of Zone Analysis is found in the idea plane and the different species in the notation simply meet the requirements of idea plane. The emergence of the tool of efficiency table is due to Zone Analysis. This table is capable of analysing the versatility of the notation of a scheme of classification.

Principle of Inversion

The principle of inversion deals with the application of opposite sequences employed in classifying the documents, and their filing or arrangement on the shelves. In Colon we find that this principle has been developed. The following sequences have been adopted between facets :

While Classifying Documents

BC [P]

BC [M]

BC [E]

BC [S]

BC [T]

While Arranging Documents

BC [T]

BC [S]

BC [E]

BC [M]

BC [P]

While discussing the facet-analysis, we recognised that Personality is the most concrete and Time is the least concrete. In other words, in the sequence P M E S T we find that the concreteness gradually diminishes from P to T *via* M, E and S. Under the principles of helpful sequence we find the utility of the principle of decreasing concreteness or the principle of increasing abstractness. On the basis of these, we find in the CC schedules that the facet formula runs like P M E S T everywhere. While classifying the documents we find that the succeeding facet sub-divides the preceding facet. In other words, with the help of the succeeding facet the extension of class under the preceding facet is narrowed. For example :

X

X 61

X 61 ; 4

X 61 ; 4 : 6

X 61 ; 4 : 6.44

X 61 ; 4 : 6.44 'N

Here we find that X 61 is Money, it has been divided by matter 4, *i.e.*, the paper money. X 61 ; 4 is paper money, it has been divided by Energy 6, *i.e.*, value. X 61 ; 4 : 6 is value of paper money, it has been divided by space 44, *i.e.*, India. X 61 ; 4 : 6.44 is value of paper money in India, it has been further sub-divided by time N, *i.e.*, the 20th Century. The number X 61 ; 4 : 6.44 'N means the value of paper money in India in the 20th Century. The other method of dividing it, *i.e.*, T S E M P will give absurd meaning because here the division of the preceding facet will not be meaningful if sub-divided by the succeeding facets.

But what is the justification of arranging documents in the following manner on the shelves ?

X 'N

X .44

X .44 'N

X : 6

X : 6.44

X : 6.44 'N

X 61

X 61 ; 4

X 61 ; 4 : 6

X 61 ; 4 : 6.44

X 61 ; 4 : 6.44 'N

Here we find that sequence is from most general to most specific. X'N=20th Century Economics is more general class than X.44 Indian Economics, which is less general. X.44'N 20th Century Indian Economics is a sub-division of Indian Economics. X : 6 is more specific than X.44. It is divided by space and time. In the same manner X 61 ; 4 : 6.44 'N is the most specific, here the succeeding facets narrow the extension of the preceding facets. As such we find that the nature of arrangement of the documents in this manner is from general to special. In order to examine the value of this sequence, you make an experiment by putting first the document with the number X 61 ; 4 : 6.44 'N and in the end put the document with the number X.N reversing the position of other numbers accordingly. The result will be a disorder.

Colon is able to maintain this sequence, by its rule number 025. This is the most important rule of Colon Classification. It fixes the ordinal value of the digits. Rule 0252 deals with the ordinal value of the connecting symbols, which is as follows :

← ——— → 0 ' . : ; , —

This sequence is in ascending order (*i.e.*, the value of the succeeding digits is higher than the value of the preceding digits). It is with the help of this rule that

X'N comes before X : 6 because the value of ' is lower than :

To sum up, while classifying we see that concrete comes before abstract. Secondly, we notice that for narrowing the extension of a class the style is to sub-divide the concrete by abstract. The process of sub-dividing abstract by concrete is meaningless. While arranging documents we put the abstract class=general class first ; and concrete=special class afterwards. But the provision of sub-dividing the concrete by abstract is also maintained. This is a wonderful contribution of Ranganathan.

PART IV

ON

PATTERNS AND TOOLS IN
CLASSIFICATION

“The theory of knowledge classification is concerned with the elucidation and solution of the special problems arising when the original universe classified is the universe of knowledge.”

S R RANGANATHAN

A scheme of classification should be self-perpetuating.

RANGANATHAN

Patterns in Classification

Historically speaking, there are only two patterns in classification of knowledge for documents. They are :

- (i) Enumerative classification ; and
- (ii) Analytico-synthetic classification.

The enumerative pattern is as old as the concept of classification of documents. Analytico-synthetic pattern has developed out of the enumerative pattern, when the latter pattern developed cracks and gradually became out-moded. Two features of the universe of knowledge, *i.e.*, its infinite nature and the dynamic continuum, ultimately succeeded in breaking the back of the enumerative pattern. This was unfortunate because the enumerative pattern was simple in its structure, while the analytico-synthetic pattern is comparatively not so simple. The difference between the simplicity of these two patterns can be compared with the difference in the simplicity between the Medieval Era man and his knowledge, and the Space-Age man and his knowledge. In other words, the modern man is less simple and so also is his knowledge, as compared to the man in distant past and his knowledge at that time.

Let us discuss the features, merits and demerits of these two patterns in classification of knowledge.

1 **Enumerative Scheme.** The enumerative scheme mentions all possible specific subjects in its schedules in a preferred helpful sequence. It assigns to them the respective class numbers. Mills¹ says that the classes enumerated comprise the simple subjects (reflecting one facet in the subject) and a selection of compounds (reflecting several facets). The classes enumerated are given ready-made class numbers. This means that compounds and complex specific subjects which are not enumerated, and thus not given ready-made class numbers, cannot be individualised.

Vickery says that an enumerative pattern is 'a classification which enumerates in its schedules all possible subjects'. Ranganathan holds the view that it is 'a classification scheme in which most of the classes are enumerated *ad hoc*, instead of enumeration being restricted only to basic classes, and the isolates of various categories'. Here Ranganathan not only defines the enumerative scheme but also distinguishes it from the analytico-synthetic pattern. The schedules of enumerative scheme are *monolithic* and not *polythitic*.

Features of Enumerative Pattern.

- ✓ (i) It is monolithic or single in structure. A specific subject 'curriculum in Secondary Education' will have to go either to Secondary Education or to Curriculum; a place showing both, one under another, is not possible.
- ✓ (ii) It lacks connecting symbols and facets.
- ✓ (iii) All possible classes are enumerated.
- ✓ (iv) It is a dictionary of sentences.
- ✓ (v) It is more or less of helpful nature.
- ✓ (vi) The emphasis is on the relative index.

1 Mills (J) : Modern Outline of Library Classification, p. 98.

- (vii) The size of the schedules is bulky while the possible number of specific subjects that can be individualised is limited.
- (viii) May have a pure and less versatile mixed notation.

Merits.

- (i) It appeals to the librarians for its simplicity.
- (ii) The relative index is comprehensive.
- (iii) One need not classify in detail and bother for co-extensiveness.

Demerits.

- (i) It can translate only such specific subjects which are formed by dissection and denudation. The specific subjects formed by lamination and loose-assembly cannot be specified. In other words, it is not fit for compound and complex specific subjects.
- (ii) New specific subjects cannot be given class numbers until the classificationist assigns number to it.
- (iii) It contains bulky schedules which are not exhaustive enough to accommodate all possible specific subjects.
- (iv) Consistency in the application of characteristics is difficult to maintain.
- (v) There is no provision for the synthesis of ideas in the notation.

Factors which out-mode the Enumerative Pattern.

- (i) By the turn of the present century the documents dealing with micro-thought, became enormous.
- (ii) The manifestation of specific subjects started towards specialisation.

- (iii) Facets like organs and problems of a class got more inter-related in their exposition and became the topics of greater interest.
- (iv) In the exposition of the subjects reference to space and time facets became more general.
- (v) Multi-dimensional progress of knowledge started.
- (vi) Number of periodicals reached 6 digits which made documentation a necessity. The tool required was the depth classification instead of superficial classification.
- (vii) Various types of relations—started appearing among classes and the isolates of classes.

Due to these factors the enumerative pattern found itself helpless and therefore became out of date. These factors troubled the thinkers in the field and as the necessity is the mother of invention, the thinkers like Henri La Fontain, Paul Otlet, Ranganathan, and Cordonnier, were able to show the new way. This new way is the Analytico-synthetic pattern of classification.

2 Analytico-Synthetic Pattern. Vickery² says, "An analytico-synthetic classification scheme, such as Ranganathan and Cordonnier have devised, transforms each constituent term into a classification symbol, and represents the subject by an aggregate of such symbols." Mills³ points out that in an analytico-synthetic classification, "The subject field is first analysed into facets, and class numbers then constructed by synthesis." These definitions are not comprehensive, as will be clear from the following account.

In an analytico-synthetic pattern, one finds provision for analysis in all respects (not only facets) and the possibility of synthesising all possible compound and complex specific subjects. (Such a scheme gives only the series of

² Vickery (B C): Classification and Indexing in Science, p. 3.

³ Mills (J): Modern Outline of Library Classification, p. 205.

schedules of the fundamental concepts in a more or less helpful sequence; and prescribes for nuts and bolts for their synthesis.) These features facilitate the task of assigning distinctive class number to any specific subject thrown forth by the universe of knowledge. Such a pattern requires a set of postulates for its working. Ranganathan⁴ mentions five stages for classifying any subject according to this pattern.

Analytico-Synthetic Process.

- (i) Analysing the subject into its ultimate phases and the facets in different phases, and naming the isolates in each facet.
- (ii) Rearranging the names of the isolates so as to conform to the syntax of the classificatory language adopted, *i.e.*, the postulates regarding the sequences of phases, rounds, levels and all facets arising therefrom.
- (iii) Changing the name of each isolate into the standard terminology adopted in a scheme.
- (iv) Translating the name of the isolate in each facet into isolate number, with the aid of the schedule for the facet and the devices applicable for it.
- (v) Synthesising the basic class number and the different isolate numbers into the class number with the aid of the connecting symbols prescribed in that scheme.

Features of the Analytico-Synthetic Pattern.

- (i) It is polythetic or plural in structure.
- (ii) Provides for the analysis of specific subjects, according to the philosophy of classification into phases, facets, isolates, etc.
- (iii) Enumerates only fundamental concepts and isolates in its schedules, all possible specific subjects are not enumerated.

⁴ Ranganathan (S R) : Prolegomena to Library Classification, p. 228.

- ✓(iv) It is a dictionary of words as against the dictionary of sentences.
- ✓(v) It is more helpful.
- ✓(vi) It is possible to synthesise the class numbers through a set of connecting symbols.
- ✓(vii) Its process is divided into Idea plane, Verbal plane and the Notational plane.
- ✓(viii) It does not depend solely on the index for its working. The schedules are slim.
- ✓(ix) Adopts mixed notation as a base.
- ✓(x) Maintains hospitality in arrays and chains.
- ✓(xi) Mnemonic qualities are maintained to a greater extent.
- ✓(xii) Adopts various devices for its working.

Ranganathan thinks that the analytico-synthetic pattern has a great potentiality as a transformer language. Some of its schedules are common to all subjects, some are common to some subjects and certain special ones are common to individual subjects.

Merits.

- ✓(i) Applies economy in schedules.
- ✓(ii) Is able to perform the role of classification, *i.e.*, co-extensiveness and individualisation of each specific subject by giving simple numbers to simple classes, compound numbers to compound classes and complex numbers to complex classes.
- ✓(iii) It can meet any challenge from the Universe of Knowledge.

Demerits.

- ✓(i) Ready-made class numbers are not available.

- (ii) Does not provide simple numbers to compound and complex classes. In order to reach co-extensiveness, its numbers also become compound and complex, respectively.
- (iii) It is not understandable to many through simple and casual efforts. Requires detailed technical study.
- (iv) Deals with logical and abstract principles.

The work of classifying a document cannot any longer be as with the monolithic enumerative schemes. The index approach practically fails in classifying the micro-thought. What one requires today is a polyolithic analytico-synthetic pattern. In the various countries of the world, as given below, we find that the analytico-synthetic pattern is getting more currency in research on it ; and in its application.

In France, the contributions of Serge Tchakhotine, D Dobrowolski and Cordonnier, etc., are important for the concept of an analytico-synthetic pattern. In Great Britain, the works of Holmstrom, Brisch, Farradane, Foskett, Vickery, Miss Kyle and others, have given a fatal blow to the reputation of an enumerative pattern of classification and to its utility, particularly in the area of micro-thought. It is this land of light and reason, wherefrom the protagonists of the enumerative pattern, need have the greatest fear. In the United States, very valuable works have been contributed by Calvin N Moores, J W Perry, U S Patent Office, H P Luhn and Taube, etc, which take ahead the cause of the Analytico-synthetic pattern.

Starting from the time of the UDC *via* the contributions of Ranganathan to the present era of assimilation and development of analytico-synthetic pattern in different lands under different garbs, it seems that the enumerative pattern was a concept of the past, a distant past indeed.

Postulational Approach

Definition. The purpose of the postulational approach to classification is to help a scheme in visualising the discipline of classification objectively. It also checks the scheme against any confused thinking. This is done by stating certain postulates (fundamental principles of universal validity in a field) as a starting point. The New Standard Dictionary defines the term postulate in the following words. Only three meanings are given here :

- (i) A proposition, claim or basis or argument laid down as well known ; too plain to require proof ; a self evident truth.
- (ii) A self evident statement regarding the possibility of a thing.
- (iii) A condition precedent that must be in use to explain or an account for a thing ; as peace is a postulate of prosperity.

In the mathematical sense, Ranganathan⁵ says that in this method of approach, "One is not bound by any pre-conceived metaphysical or other ideas, and not even by factual experiences. Certain postulates are assumed and all the implications are worked out." He further says, "Here the whole work takes the form, if so and so, then so and so." We may select any of the above meanings but the basic thing is that a postulate should stand valid under a set of prescribed conditions.

The term postulational approach to classification should mean that there are certain facts and experiences, based on assumed principles, in the field of knowledge and their expositions. In turn, these principles are supported by the facts and thus become too simple to be doubted. The question arises as to what processes are adopted in the making of postulates ? Have the postulates been derived after surveying the field concerned or they have been devised

⁵ Ranganathan (S R) : Prolegomena to Library Classification, p. 449.

to work as a basis for surveying the field? The answer is that the postulates are derived by adopting both the processes one after the other in a series, resulting into the spiral of the scientific method. A person may conceive certain ideas either through observation or through intuition. At once they will not become postulates. He will make attempts to generalise so as to give them the shape of principles. Therefore, he puts his hypothesis to experiment. If they stand the test, they are declared to be valid principles. A number of tests are again conducted to find out the validity of the principles under different conditions. If they are found universally acceptable, they are called Postulates. In this entire process, we find that when the hypothesis is first experimented it often turns out to be partially true and partially false. This necessitates modifications in the principles. Modified principles are again examined, still we find minor faults in them. Like this the principles continue to be modified until they become generally acceptable. If they succeed, they become self evident truth and become the postulates.

Types of Postulates. In the philosophy of classification of knowledge embodied in the documents the postulates belong to three areas of work. They are :

- (i) Postulates for the Idea Plane ;
- (ii) Postulates for the Verbal Plane ; and
- (iii) Postulates for the Notational Plane.

(i) **Postulates for the Idea Plane.** In *Prolegomena* Ranganathan has mentioned a complete list of postulates on which his Colon Classification stands. Some of the important postulates for the Idea Plane are given below :

- (a) Time, Space, Energy, Matter and Personality are postulated as Five Fundamental Categories under different main classes. More than one main class may form a specific subject.
- (b) Every characteristic can be assigned to one and only one fundamental category.

- (c) Division of a Universe on the basis of a characteristic may yield classes containing only wholes, portions, organs or constituents, respectively.
- (d) The first manifestation of Energy in a basic class is its First Round Energy Facet ; the second manifestation the Second Round Energy Facet ; and so on. There are zones in knowledge.
- (e) An energy facet can have only one array.
- (f) The first round is started by the Basic Class.
- (g) Energy Facet can start a new round of its own.
- (h) In any round, any number of levels of Personality and Matter can occur consecutively.
- (i) There is no level for Energy.
- (j) The sequence between the categories under any round will be P M E S T, there may be different types of relations between the isolates under one facet.
- (k) Space and Time can occur only in the last round.
- (l) A common Personality or Matter isolate may start a round.
- (m) A common Personality or Matter isolate may be after Space or after Time.

Let us examine the role of the above postulates in the idea plane. All these postulates have been worked out by Ranganathan after careful examination of the trends of the universe of knowledge and their exposition in documents. From the first edition to the seventh edition, he has introduced modifications in his principles, of course in the light of new facts. For this purpose, there may still be many modifications in store, which, when noted, he may introduce. The role of the above postulates is that they help in maintaining a consistent path which all, who have studied the postulates, should follow. Each postulate has a practical implication on the

nature of knowledge and the modes of their formation in documents. Analysis of the specific subjects becomes simpler through these postulates. The final test of these postulates is that they are in a line with the exposition of knowledge and through them the documents embodying such knowledge are classified. Thus, these postulates reveal what knowledge comprises and that how it should be treated? As the practical examples will show, later on in this chapter, these postulates are found valid also in DC and UDC. The only thing is that their treatment in DC and, to some extent in UDC, is not in an objective manner. They practise such postulates without recognising them explicitly, although they are mentioned in the body of their rules in one manner or in another.

(ii) Postulates for the Verbal plane. There are not many postulates under this area. The two important postulates are given below :

- (a) Each specific subject must belong to a Basic class, whose term should be added to the title of the document.
- (b) Terms used in the specific subjects may be of compound nature, which should be broken into the constituent kernel terms.

These postulates help in the treatment of specific subjects in the verbal plane, where we have to come in our way from the idea plane to the notational plane. The situations with which these postulates deal with are common to all languages. Hence, they are valid under each scheme of classification.

(iii) Postulates for the Notational Plane. Postulates for the notation are clearly available under all schemes of classification. They deal with the types of digits used for different purposes and their place values in the arrangement. Some of the postulates are given below.

- (a) Class number may consist of one or different types of symbols or digits.

- (b) Digits may be either substantive digits (significant digits) or connecting digits.
- (c) There may be a sectorising digit under each type of substantive digits.
- (d) There may be different zones in digits allotted to respective zones of the idea plane.
- (e) Certain connecting digits may be required in notation to indicate the frozen ideas in a specific subject.
- (f) Each digit will have its ordinal value or place value in the sequence of arrangement.
- (g) Decimal numbers suit well the needs of notation.

We find that DC, UDC and CC provide for these postulates in their notation. All the three schemes have specified subjects. They have both substantive and connecting digits. In UDC and DC, the digit 9 practically works as a sectorising digit and accommodates 'others'; in CC for the same purpose it has a different role. DC and UDC very clearly recognise at least two zones, the main schedules and the form divisions. CC recognises four zones. Frozen ideas are represented in brackets in CC and in different ways in DC and UDC. Each digit has a notational value in all schemes. DC, UDC and CC respectfully adopt the decimal notation.

Stages of the application of the Postulates. These postulates are applied in the following steps in the processes of determining the specific subjects and their translation from the idea plane *via* the verbal plane in the notational plane. These steps are :

Step 0 — Raw Title

Step 1 — Full Title

Step 2 — Kernel Title

Step 3 — Analysed Title

Step 4 - Transformed Title

Step 5—Title in Standard Terms

Step 6—Title in Number

Step 7—Title in Synthesised Numbers

Step 8 —Verification by Reverse Translation.

Steps 0 to 4 deal with the work in the Idea plane. Step 5 deals with the work in the Verbal plane. Steps 6 and 7 are concerned with the Notational plane. Step 8 involves the examination of work in all the planes. Step 0 shows the title as it appears on the document. Under step 1, we add the name of the main class, if it is not included in the title, and break the compound terms into their constituent terms. Under step 2, we show only those terms which denote kernel ideas. This means that auxiliary words like *of, in, for*, etc., which are used in a natural language and which do not require the translation in the artificial language, are omitted. Under step 3, the kernel ideas represented by their respective terms are analysed (finding out who is what). They are branded according to the postulates. Under step 4, these terms are arranged in a sequence about which the postulates exist. Under step 5, the non-standard terms are replaced by the terms adopted in the scheme of classification. Under step 6 each term is translated into numbers. Under step 7 the various numbers are connected with each other by the symbols prescribed by the postulates. Step 8 examines the entire process in the light of the postulates.

Examples. Let us discuss one example of each from the following types of the specific subjects according to the DC and CC schemes and the postulates.

- (a) Simple specific subject,
- (b) Compound specific subject,
- (c) Complex specific subject.

(a) A simple specific subject : Principles of Biology.

Step 0 : Raw Title

Principles of Biology.

Step 1 : Full Title

Principles of Biology.

Step 2 : Kernel Title

Principles Biology.

Here the word 'of' has been omitted because it is a preposition and hence an auxiliary word.

Step 3 : Analysed Title

Principles Biology (BC).

The term has been analysed as the Basic Class.

Step 4 : Transformed Title.

Biology, Principles (BC)

Here the term principles has been brought after Biology.

Step 5 : Standard Term

Biology.

Biology is the standard term, which means Biology, its principles, etc.

Step 6 : Title in Numbers

61 CC G

62 DC 574

Step 7 : Synthesised Number

71 CC No. G

72 DC No. 574

There is no need for synthesis by insertion of a connecting symbol because only one unit of knowledge is available.

Step 8 : Verification by Reverse Translation.

81	In CC	G	=Biology	} No other facet is involved.
82	In DC	574	=Biology	

(b) A Compound Specific Subject : Feeding of Cattle in India.

Step 0 : Raw Title.

Feeding of Cattle in India.

Step 1 : Full Title.

Feeding of Cattle in India in 'Animal Husbandry'.

As the name of the main class was missing in the raw title, it has been added under this step.

Step 2 : Kernel Title.

Feeding Cattle India Animal Husbandry.

The words 'of', and 'in' are auxiliary words. They are not necessary for depicting the specific subject of the document. Hence, they have been omitted.

Step 3 : Analysed Title.

Feeding [E] Cattle [P] India [S] Animal Husbandry (BC).

Feeding is an action, hence the manifestation of Energy ; Cattle is a group of animals, hence the manifestation of Personality ; India is a geographical unit, hence the manifestation of Space ; Animal husbandry is a recognised Basic Class.

Step 4 : Transformed Title.

Animal Husbandry (BC) Cattle [P] Feeding [E] India [S].

The postulates prescribe that the BC will come first of all, and the sequence of facets will be P M E S T. As [M] and [T] are absent, the sequence maintained is [P] [E] [S]

Step 5 : Title in Standard Terms.

Animal Husbandry (BC) Cattle [P] Feeding [E] India [S].

All the terms used are standard terms. Therefore, no need for replacing them.

Step 6 : Title in Numbers.

61 CC KZ (BC) 2 [P] 1 [E] 44 [S]

62 DC 636 (BC) 2 [P] 084 [E] 954 [S]

Step 7 : Synthesised Number

71 CC KZ 2 : 1.44

72 DC 636.20840954

In CC : is used to connect 1 of [E] and is used to connect 44 of [S]. In DC . is used to connect 2 [P] and 0 is used to connect 954 of [S].

Step 8 : Verification by reverse translation.

81 In CC

KZ is Basic class

2 is Personality facet

1 is Energy facet

44 is Space facet

Meaning thereby 'Feeding of Cattle in India'.

82 In DC

636 is Basic class

2 is Personality facet

084 is Energy facet

954 is Space facet

Meaning thereby 'Feeding of Cattle in India'.

- (c) A complex specific subject : 'A Study in the Ability of Genius for Higher Science Education'.

Step 0 : Raw Title.

A study in the ability of genius for higher science education.

Step 1 : Full Title.

A study in the ability of genius (in Psychology) for higher science education.

Here the name of main class Psychology has been added.

Step 2 : Kernel Title.

Ability Genius Psychology (Biasing) Higher Science Education.

The words : 'a study in the', 'of', 'in', 'for' and 'in' used in the raw title have been omitted. They are not needed in the translation of the specific subject, because the subject is bound to be a study and other omitted words are auxiliaries.

Step 3 : Analysed Title.

Ability [E] Genius [P] Psychology (BC)

(Biasing) Higher [P] Science (SDI) Education (BC)

Ability is problem, hence [E], Genius indicates a group, hence [P] of the Basic class 'Psychology', the term Science qualifies the grade Higher [P] in Education, and here is a temporary occurrence of isolate Science in Basic Class 'Education'; hence ; it is an application of Subject Device. Here Science is not qua Science, the main class.

Step 4 : Transformed Title.

1st Phase

Psychology (BC) Genius [P] Ability [E]
(Biasing)

2nd Phase

Education (BC) Higher [P] Science (SDI)

T is Basic class

4 is Personality facet

A is Temporary occurrence representing the isolate science.

Meaning thereby 'A study of abilities of genius for higher science education'.

82 In DC, the reverse translation is not possible because it adopts altogether a different number by ignoring the concept of subject approach to documents. The number 507.11 does not depict many important aspects of this specific subject. So, here in the notational plane DC completely fails.

Merits of Postulational Approach. The postulational approach is a tool which an Analytico-Synthetic scheme of classification must adopt. CC gives a demonstration of its application. In a manner, all schemes of classification are built on certain postulates. The difference in this respect between CC and other schemes is, that while CC mentions these postulates specifically, others do not mention their postulates clearly.

The advantages of this method are :

✓(a) It avoids confusion in the making of classification and in its practice.

✓(b) One can examine the discipline objectively.

✓(c) Through it, each subject brings its own facet formula.

✓(d) Through postulates it is possible to compare the efficiency of various schemes.

✓(e) Postulates help in the treatment of different features of the Universe of Knowledge, in a suitable manner, in a scheme of classification.

The possible demerits. ✓(a) It can be fully applicable only to analytico-synthetic schemes. Enumerative schemes cannot apply postulates to full extent. But in case of simple and lesser degrees of compound specific subjects,

the postulational approach can succeed to the full extent, even in enumerative schemes.

(b) Simplicity in the classification of compound and complex classes of knowledge is not possible. But the situation will get completely deteriorated in absence of the postulates.

(c) It makes the discipline of classification abstract and introduces scientific methods as against the traditional and the less useful practices.

(d) The postulates of one scheme may differ from the postulates of others. No universal agreement on the postulates is possible. For example, to some there may be only five fundamental categories while for others there may be seven or less than five categories. But such issues can be decided academically.

While concluding, it may be said that the postulates under different schemes may differ, but the existence of postulates, under any scheme, cannot be denied. Secondly, it is through postulates that an objective approach to classification, as against the subjective interest, is possible. The objective treatment takes out the classification from the jurisdiction of confused and vague thinking. It is an important contribution of Ranganathan towards the emancipation of classification from the clutches of traditional unscientific thinking.

COMMON ISOLATES IN CLASSIFICATION

A scheme of knowledge classification will comprise Main Classes, Facets, Isolates and Sub-Isolates. The Isolates are of two types :

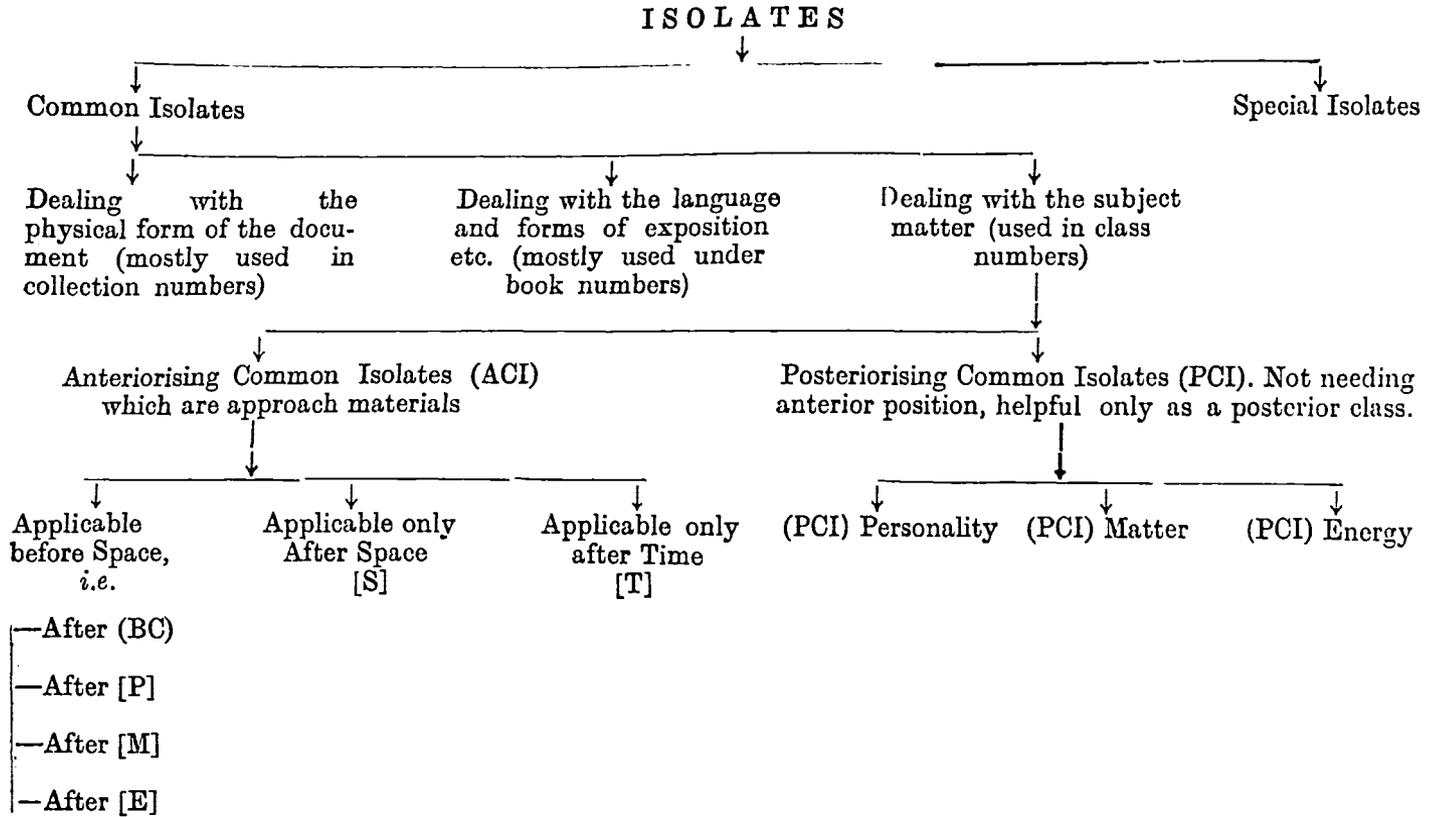
(a) Common Isolates (common to all Main Classes and Facets, etc.).

(b) Special Isolates (special to one or more subjects, but not to all Main Classes and Facets, etc.).

Common Isolates are those minor units in the structure of knowledge which are represented by the same term and by the same number wherever they occur in a scheme of classification. Ranganathan⁶ defines it as, "Common Isolate : Isolate idea represented by the same isolate term and the same isolate number in more or less every class having it." Common Isolate is an old feature of classification. Melvil Dewey recognised it as Form Divisions and introduced it in DC. It received a classical and a comprehensive treatment at the hands of Bliss, who used the term systematic schedules. Bliss also recognised the types of Common Isolates and termed them as *anterior* and *ancillary*. Cutter adopted this concept in his Expansive Classification. In his Subject Classification, Brown not only maintained the principle of Common Isolates, but he also listed those isolates which were common only to a few and not to all. It is on the basis of such applications of Common Isolates in different schemes and due to careful analysis of its scope that Ranganathan has been able to give a scientific treatment to Common Isolates in his *Colon Classification*. On Common Isolates Bliss⁷ says, "These are systematic (Common) not only in the ordinary sense but in that they are applicable more or less extensively throughout the system. Some may be applicable, wholly or partly, under any class, others only under certain classes or sections." A general approach by Sayers to this concept is from the side of the documents as

⁶ Ranganathan (S R) : Prolegomena to Library Classification, p. 167.

⁷ Bliss (H E) : Organisation of Knowledge in Libraries, p. 81.



a starting point and not through knowledge or classes. Still, he says, "Certain of these methods of treatment are common to every subject, and a series of form divisions to individualise them has been attached to most library classifications."

In their works, Vickery and Mills have also used the term Common Facets at certain places, *e.g.*, form of presentation, etc., under it. But Common Facets and Common Isolates are two different concepts. Loose use of either will create confusion. The term Isolate is of greater intension than the term facet. One can always find common isolates in Common Facets. The Facets which are common, are divisible into isolates. Therefore, an Isolate is more smaller a unit. Time and Space are common facets. In documents they will appear not only as Time or Space facets, but also as some of the units under these facets, *i.e.*, 20th Century and Great Britain, respectively. Lastly, facets are not the ultimate units of knowledge while the isolates are the last in the link. On the meaning and scope of Common Isolates it may be said that it means an isolate whose isolate number represents the same term and the same idea irrespective of the host class to which it is attached.

Types of Common Isolates.

The Common Isolate took various shapes in its evolution from the time of Dewey to the time of Ranganathan. It was so confusingly net that it required considerable care in its analysis. According to the present stage in its development the Common Isolates fall under three categories :

- (i) Common Isolates in sequence classification dealing with the physical form of documents ;
- (ii) Common Isolates in language and forms of exposition in documents ;
- (iii) Common Isolates in the structure of knowledge appearing under Main Classes.

Common Isolates in sequence classification are, for example, oversize, undersize documents etc. Common Isolates in language and form of exposition are, for example, Index, List, Data book, Picture, Lecture, Debate, Verse, Drama, Quotation, etc. (complete list given in Chapter 02 in Colon Classification, 6 ed.). Sayers used the term outer form divisions for such Common Isolates.

For Common Isolates in the structure of knowledge, Sayers uses the term inner form divisions. They are of two types :

- 9.9
- (a) Anteriorising Common Isolates.
 - (b) Posteriorising Common Isolates.

(a) Anteriorising Common Isolates.

Bliss recognised the need of distinguishing such Common Isolates and gave them *anterior* positions. The word anterior means before in time and place. In the field of knowledge there are certain isolates, which if associated with a class, will be sought for preliminary perusal before the documents on the class concerned are consulted. For example, bibliography on a subject is generally desired to be placed before its subject. Documents dealing with certain Common Isolates are considered approach materials to the subject. Such approach materials should be placed before the subject concerned. In the case of most of the anteriorising Common Isolates we find that the extension of the subject to which it is applied is not narrowed. This is the additional reason, for such documents to get prior places. Canon of Helpful Sequence suggests anteriorising position to approach materials. This means that the approach materials like bibliography, dictionary, periodicals, case study, statistics and survey, etc., on a class will be placed before the documents on that class itself.

Anteriorising Common Isolates are of three types :

- (i) Applicable before Space facet (*i.e.*, anywhere after the BC, P, M or E) not after Space and Time Facets.

- (ii) Applicable only after Space Facet and nowhere else.
- (iii) Applicable only after Time Facet and nowhere else.

These have been scheduled under Chapter 2 in CC, 6 ed. One can examine that the isolates mentioned under Chapter 21, in CC, will not be of any use if mentioned after Space or Time ; isolates under 22 are most useful if applied after space, and the isolates enumerated under 23 have a better meaning if applied after the Time Facet. Bibliographic Classification of Bliss provided for the anterior positions to such isolates but no such distinctions, as in CC, were made in it. DC has no notational tool at its disposal to give anterior position to such isolates. In UDC, we find the connecting symbol (O.....) which provides for anterior positions to such isolates. The following examples show the sequence between classes with ACI and without ACI :

<i>CC No.</i>	<i>Specific Subjects</i>
<u>D6a</u>	Bibliography—Mechanical Engineering.
D6k	Dictionary—Mechanical Engineering.
<u>D6w</u>	Biography—Mechanical Engineers.
<u>D6</u>	Mechanical Engineering.

The sequence of these documents on the shelves will be in the same manner as mentioned above. There are two peculiarities about such isolates. Firstly, they do not require a connecting symbol for their attachment to a class number. Secondly, they possess their own facets, for example :

<i>ACI</i>	<i>Facets</i>
a Bibliography	<u>a [T]</u>
k Cyclopaedia	k [P], [P ₂]
w Biography	w [S], [T]

They initiate their own round in the facet formula of a class where they are attached.

(b) Posteriorising Common Isolates.

Posteriorising Common Isolates narrow down the extension of the subjects to which they are applied. They are of three types falling under Personality, Matter and Energy. Use of connecting symbols is necessary for their attachment to the class numbers. They are arranged after the documents on the class, to which they are attached, for example :

<i>CC No.</i>	<i>Specific Subjects</i>
D6	Mechanical Engineering
<u>D6 : g</u>	Mechanical Engineering—Criticism

The above sequence will be maintained in their arrangement on the shelves.

The subject of greatest attention today is further investigations into the areas of Common Isolates, particularly the Posteriorising Common Isolates.

DC and Common Isolates.

Common Isolates in DC, 16th ed., are known by the term Form Division. DC was one of the earliest schemes to recognise the existence of Common Isolates in the idea plane and it also provided for them in its notational plane. But, it seems, DC failed to have complete control over this phenomenon, as will be clear from the following changes introduced in its different editions :

12th ed. used the term Form Divisions to denote Common Isolates.

13th ed. used the term Common Sub-divisions to denote Common Isolates.

14th ed. used the term Uniform Sub-divisions to denote Common Isolates.

15th ed. used the term Form Division to denote Common Isolates.

The 13th ed. made an attempt to further subdivide the concept of Common Isolates into the following :

- 000 Miscellaneous Common Sub-division
- 00 View Points
- 0 Form Divisions.

But the 14th ed. rearranged these categories in the reverse order. And to the great surprise of many of us, the 16th ed. excluded all these sub-groups and only Form Divisions have been maintained. What remains in the 16th ed. is applicable to the classes with the help of the connecting symbol 0. They are —

- ✓01 Philosophy and Theory
- ✓02 Handbooks and Outlines
- ✓03 Dictionaries and Encyclopaedias
- ✓04 Essays and Lectures
- ✓05 Periodicals
- 06 Organisations and Societies
- ✓07 Study and Teaching
- ✓08 Collections and Polygraphy
- ✓09 History and Local Treatment.

Sayers⁸ realised that there are two types of form divisions, *i.e.*, Outer form divisions and Inner form divisions in DC. Editors of the 16th ed. mention that some form divisions are the true forms and certain others are the subject aspects⁹. They are :

<i>True Forms</i>	<i>Subject Aspects</i>
02	01
03	07

8 Sayers (W C B) : Introduction to Library Classification.

9 Dewey (Melvil) : Decimal Classification, 16 ed., p. 11.

<i>True Forms</i>	<i>Subject Aspects</i>
04	09
05	
06	
08	

The DC suggests that if a document deals with two form divisions, one from each category, for example, Essays on the teaching of Biology, only the subject aspect, *i e.*, study and teaching, should be given.

DC Number :

Biology	Teaching	Essay
574	07	04

The number shall be 574.07 and not 574 04. It also suggests that if there are already four or five digits in a class number the form division may not be used. It further mentions that only one form division be given if there are more than one applicable to a subject. Another thing in DC is that certain class numbers enumerated in schedules contain the form number as well, for example, 655.1 History of Printing. Here the common isolate history has been individualised by the class itself without taking the help of the form division 09 which is prescribed for history, the form division.

As the things stand, there are two categories of form divisions in DC. One, the general form divisions mentioned on pages 89-93 (16th ed.) and second, the special form divisions given under 100, 200, 300, 400, 500, 600, 700, 800 and 900, which are applicable only to the respective classes. All form divisions are filed after the class. One finds in the 16th ed. that 016 is assigned, for the first time, to bibliographies, a posterior class. If it is used in relation to a class, say 543, its number will be 543.016 and its place will be after 543. This will give unhelpful sequence.

DC has not yet recognised the Common Isolates in the areas of sequence number, document number and class number. Nor it has provided for Anteriorising and Posteriorising common isolates along with their details. As it is a scheme for broader classes and their numbers, it feels that these qualifications for Common Isolates or Form Divisions need not be provided for.

In UDC also, the mixture of the Common Isolates of different types can be noticed. They include Book number isolates and the Sequence number isolates, and in addition to them, entire specific subjects have also been enumerated, for example :

<i>Book No.</i>	<i>Sequence No.</i>	<i>Entire Specific Subjects</i>
(042) Lectures	(041) Brochures	(075.6) Handbook of domestic economy for women and girls
(083.81) Lists	(084.122) Motion Pictures	(038) Dictionary of technical terms
(084.5) Pictorial Posters	(084.123) Sound Films	(086.7) Gramophone Records

These details indicate that except Colon, no other scheme has been able to analyse the concept of Common Isolate in a comprehensive way. Colon has been able to do so after committing many mistakes and it was only at a later stage that it cleared up its confusion by recognising three areas for Common Isolates, and within the area of Class number it distinguished between ACI and PCI with their further sub-divisions. Common Isolates provide for consistent sequence and hospitality in array. They play the role of scheduled mnemonics and have greatly helped in the recognition of Zone Analysis in CC.

SUBJECT DEVICE

Purpose. Subject device in notational plane deals with one of the most important phenomena of knowledge classification in idea plane. This phenomenon is the temporary occurrence of isolates of one main class into other main classes. This is the result of the growing specialisation on minor areas of knowledge. In the structure of knowledge we find that the Main Classes are divided into the facets and the facets are divided into their isolates. Each isolate idea has got, so to speak, its permanent place under a facet of one or more basic classes. A permanent place for an isolate idea is created under a Main Class if sufficient literature has accumulated on that isolate idea. Another criterion for creating a permanent place for an isolate idea is that the isolate should be the constituent part of the whole facet in a Main Class. For example, Hypnotism is a constituent part of the whole Metapsychology, under Energy facet in Basic Class Psychology. There may be sufficient literature on it or not, this isolate idea will find a permanent home in the Basic class Psychology. One finds that in addition to the occurrence of the permanent isolates of a class under the same class, the permanent isolates of different Basic Classes also occur temporarily under it. For example :

Specific subject : Translation Machine.

Here we find two isolates — Translation and Machine. Translation belongs to the Energy facet of the Main Class Linguistics and Machine belongs to the Personality facet of the Main Class Engineering. The permanent home for the isolate machine is under Engineering and the permanent home of the isolate translation is in the Main Class Linguistics. But in the above subject we find that the isolate translation occurs temporarily under Main Class Engineering for the sub-division of its isolate machine. It will not be wise for a scheme also to enumerate the isolate translation under Engineering, because it has occurred just once under it. Then how to individualise the idea of machine ÷ translation ? The way out in the notational plane is to borrow the isolate number translation from Linguistics

and to put it under Engineering. Colon does it in the following manner :—

D66,8 (P : 795) = Translating Machine.

Putting of isolate number (P : 795) which stands for the term Translation within brackets and attaching it to the class number D66,8 for machinery is Subject Device. This has been done to indicate the *temporary occurrence* of an isolate of a class under a different class.

This will, however, never mean that one isolate term should be enumerated only under one main class. In the schedules of classification we find that a particular term is enumerated under different main classes. For example, the term Physiology will be found under Biology, Zoology, Botany, Agriculture, and Medicine, both in CC and in DC. The justification for the availability of an isolate term under more than one main class is that the same isolate has sufficient literary warrant under all of them. For example, we find that the term Physiology has sufficient literary warrant (accumulation of literature on) under these Main Classes so as to claim placements under all of them.

Application. Under these conditions the scope of the application of Subject Device becomes clear :

Subject Device, in notational plane, is the borrowing of an isolate number from any Basic Class for application under a different Basic Class, where it is not enumerated because sufficient literary warrant does not, therein, exist for it. This is done for sharpening the focus under a class by indicating a temporary occurrence of an isolate number of an alien class. Having agreed that the need of subject device, in the notational plane, is to individualise the temporary occurrence of one isolate idea in a different class, let us examine the possible places where the Subject Device can be applied ? The possible places for its occurrence are all the schedules of a classification. It is so because an isolate idea (under a Basic Class) of any order and species may be required to borrow an isolate idea of a different

class or its further sub-division. It can be explained with the following illustration :

Sharpening a class by borrowing a facet :

- 1 BC, (SD) Here (SD) is employed to indicate the Personality facet borrowed from a different class.
- 2 BC; (SD) Here (SD) is employed to mention the Matter facet borrowed from a different class.
- 3 BC: (SD) Here (SD) is employed to individualise Energy facet borrowed from a different class.

Sharpening an isolate of a facet by borrowing a sub-isolate :

- | | |
|--------------------|---|
| 4 BC, Isolate (SD) | In these cases, the (SD) is |
| 5 BC; Isolate (SD) | employed to further sub- |
| 6 BC: Isolate (SD) | divide the isolates of P M and E, respectively. |

Examples of above kinds of incidences in CC :

Sharpening a facet by (SD) :

1 J, (Z) Agricultural laws. Here isolate (Z) has been analysed as P.

2 J ; (2,151) Agricultural micro-films. Here the isolate (2,151) has been analysed as M.

3 J : (E : 3) Agricultural analysis. Here the isolate (E : 3) has been analysed as E.

Sharpening an isolate of a facet by (SD) :

4 S,4 (D6) Psychology of Mechanical Engineers. Here (SD) divides the isolate 4 of P under S.

5 NQ ; 5 (E113) Painting on Copper Metals. Here (SD) divides the isolate 5 of M under NQ.

6 Y : 3 (T) Educational activities in Society. Here (SD) divides the isolate 3 of E under Y. (The isolate Educational in its analysis is 2 P.)

These incidences of the facets, isolates and/or their divisions, indicate that the Subject Device falls under the group of the compound specific subjects, hence it belongs to the category of compound class numbers.

Types : Such situations in knowledge classification will fall under two categories :

(a) Those places where the temporary occurrence of isolates has already been visualised by the classificationist. A provision is made for such incidences with the help of a rule. DC and CC have incorporated such rules in their schedules.

DC : In DC, it is done with the help of the instruction 'Divide like 000-999', e.g., under 338.47—'Specific Secondary Products'.

CC : In CC, we get the instructions 'To be subdivided by (SD)' and illustrations are often given, e.g., under Y : 348=Inauguration.

(b) But it is simply impossible to foresee all such places where (SD) is to be applied, because the places are many. Secondly, this phenomenon is not static. Therefore, it is not possible to arrest all such situations for providing the instructions at such places. So a general rule is needed, which can be applied at any place of temporary occurrence of isolate ideas. This has an implication on the notation, *i.e.*, it should have a distinctive symbol to indicate the attachments of temporary occurrences. Colon adopts the symbol 'starter and arrester' () to distinguish (SD) in its notation. In DC, we do not find a provision of this kind. The result is that the temporary occurrences at places, other than those already enumerated in schedules, cannot be shown. This creates a vacuum in its notational applications. The provision for subject Device in a scheme is necessary from the points of view of Canons of Consistent Sequence, Helpful Sequence, Hospitality in Array, Hospitality in Chain and Mnemonics. CC provides for it in a satisfactory manner.

Subject Device vs Inter-subject Phase relation : A distinction between the application of Subject Device and the Phase Relation is often not clear. For this purpose, it may be stated that the Subject Device is applied in case of compound specific subjects and the Inter-subject Phase Relation is used in complex specific subjects. Secondly, in (SD) the isolate of a class required in a different class is not in relation through its original Basic Class, but it is related directly to the facets and isolates of a Basic Class showing its temporary occurrence. While in an Inter-subject phase relation, the isolates or facets of different classes are first related with their basic classes and through them, in a joint manner, they appear in relation with the primary phase and its facets. For example, the isolate translation appears in D68 directly and not through Linguistics and that neither Linguistics nor translating indicate any of the inter-subject phase relations. The term translating is temporarily required just to sub-divide the isolate Machine under P of Engineering.

Subject Device in the notation of a scheme is a provision for matching the phenomenon of frequent inter-borrowing of units of knowledge in between the main classes. This happens mostly in case of the specific subjects of lesser extension. This is due to the importance which the classes, in the periphery of different subjects, have in modern scholarship. Experience shows that most of the documents appearing now will require the use of Subject Device for their individualisation. Therefore, any scheme, to remain valid must fully provide for Subject Device in its notation. CC has fully provided for it. DC has a partial provision and UDC mixes it up with Phase, Facet and other relations. In CC, due to the nature of examples, given on its page 1.31, one gets the impression that the (SD) is to be used only after : (Colon). This is because all the examples contain : before (). If one examines the examples on other pages in the same book, this false impression will soon disappear. Some time ago, a section of users of CC felt that if within the brackets (E:3) a colon appears, it should not be connected by : to a number, *i.e.*,

J : (E + 3) is not a sound number.

But soon it was realised that the number within the brackets is a frozen number, where the value is of the last digit only, therefore, no such question arises.

Subject Device is a very useful device at the disposal of the notation of a scheme.

RELATIONS BETWEEN IDEAS

In knowledge classification relations of various types occur between the units of knowledge at different orders. Such relations may be between the Basic classes ; between the facets of the basic classes, between the isolates of a facet ; and between the sub-isolates of an isolate. A specific subject may have any of the above mentioned relations or a combination of a set of such relations. These types of relations are four in number :—

- (i) Inter-subject Phase relation : Relation between two or more basic classes ; with or without their facets.
- (ii) Facet relation : Relation between two or more facets of a basic class, *i.e.* Facet analysis.
- (iii) Intra-Facet phase relation: Relation between two or more isolates within a facet.
- (iv) Intra-Array phase relation : Relations between two or more sub-isolates within an isolate of a facet.

The facet relation is done through facet analysis. It has already been discussed before. The three remaining types of relations have been discussed here. It should be noted that the availability of two or more units in a partially comprehensive manner is beyond the scope of such relations. For example, if the half part of a document deals with physics and the other half with Chemistry, there is no relation between them. They have been clubbed only in the physique of the document. If, however, the specific subject is influence of Physics on Chemistry, this embodies the relationship between them. The solution of the latter problem is in the field of classification and for the former we depend on the catalogue.

Inter-Subject Phase Relation. One method of the formation of knowledge is the loose-assemblage between two or more Basic Classes. Such classes are known as complex classes. A complex class can be made in one of the following ways :—

- (i) One simple class and another simple class.
- (ii) One simple class and another compound class.
- (iii) One compound class and another simple class.
- (iv) One compound class and another compound class.

When such types of specific subjects are formed, it becomes obligatory on the part of notation to specify such relations.

Examples of Phase Relation in CC

Connec- ting symbol	Type of relation	Example	
		Class	No.
Oa	General	Political Science and Economics	WOaX
Ob	Bias	Economics for Politicians	XObW
Oc	Comparison	Politics and Economics compared	WOcX
Od	Difference	Difference between Politics and Economics	WOdX
Oe	Influence	Influence of Economics on Politics (The class influenced will come first)	WOgX

The possible number of relations is not yet certain. Ranganathan has identified only five kinds of relations. Vickery feels that the number of possible phase relations, in scientific indexing, are many. Perry, Kent and Berry

and other teams like Andrews and Newman, have gone deep into the question of types of relations. But their fields of interest are depth classification and mechanical selection. Here, we will discuss only those types of relations which are commonly discernable in Macro-thoughts, and to some extent in micro-thoughts. Ranganathan prescribes (a) General relation, (b) Bias relation, (c) Comparison relation, (d) Difference relation, and (g) Influence relation, all in case of inter-subject phase relations. The connecting symbol for all types of relations is 0. Before arriving at these relations Ranganathan considered Tool-Phase as one of the relations. The Anteriorising Common Isolates were also considered by Ranganathan as a secondary phase. But it is now clear that these are the parts of only one basic class, to be arrived at by (SD) and (CID), respectively.

In DC, there was no provision for phase-relation before the 13th ed. The only measuring rod of unascertainable utility used was to decide the main class for topics like 'Mathematics for Economists' which was assigned a number under 330. But in the 13th and 14th eds., the connecting symbol 000 was used to combine the two phases. These symbols have now been withdrawn from the 16th ed. and thus no provision exists for connecting the phases. UDC uses : Colon as the connecting symbol for indicating phase relations along with Facet and other relations. Ranganathan suggested to the UDC Committee of F.I.D. that certain Roman smalls be assigned to the various types of relationships, for use after : Colon in UDC numbers.

Intra-facet Phase Relation. When the relations exist between the isolates of the same facet, it is known as Intra-facet phase relation. Colon has the following connecting symbols for it :

Examples of Intra-Facet Phase Relations in CC

Connecting Symbol	Type of relation	Isolates of [E] of [BC] G Biology Example	
		Class	No.
Oj	General	Trends in Morphology and Physiology	G:20j3
Ok	Bias	Physiology for Pathologists	G:30k4
Om	Comparison	Morphology and Physiology compared	G:20m3
On	Difference	Difference between Morphology and Physiology	G:20n3
Or	Influence	Influence of Morphology on Physiology (The isolate influenced will come first)	G:30r2

There is no such provision in DC wherein Intra facet phase relations could be classified under the facet number. But UDC can distinguish it by repeating the entire second isolate number after : colon.

Intra Array Phase Relation. When the relations exist between the sub-isolates of an isolate under a facet in a Basic Class, it is known as Intra-array phase relation. Colon has the following connecting symbols for it.

Examples of Intra-Array Phase Relations in CC

Connecting symbol	Type of relation	Example : Sub isolates of isolate 3 in [P] of (BC) Y	
		Class	No.
0t	General	Rural and the city folk culture	Y310t5:1
0u	Bias	City culture for rural people	Y353u1:1
0v	Comparison	City and rural cultures compared	Y310v5:1
0w	Difference	Difference between Rural and city life	Y310w5:1
0y	Influencing	Influence of city life on rural life. (The sub-isolate influenced will come first)	Y310y5:1

In DC, the relations between the sub-isolates are indicated by the higher order isolates, which contains both the sub-isolates. In UDC, individual sation can be achieved by adding the sub-isolate number after the entire class number.

The occurrence of Intra-Facet and Intra-Array phase relations is not too common in macro-thoughts. Therefore, DC does not suffer much in these respects. But CC provides for it because the trend of the exposition of knowledge is in this direction and after about twenty years, such relations will be very much found in the exposition of specific subjects, even in macro-thoughts.

SYSTEMS AND SPECIALS

A comprehensive account of systems and specials is beyond the scope of this book. The approach is, therefore, only elementary. The Main Classes in the Universe of Knowledge have been moulded into different structures through the times at various places in the world. When it

was not possible for man, interested in one subject, and living at one place, to know the details on that subject at another place, various schools on a subject developed. For example, Medicine had always been a subject of great concern for the man. Under different times, different systems developed in this subject at various places in the world. We get the systems like Homoeopathy, Unani, Ayurveda and Allopathy, etc. The ends of all these systems are concerned with the same, *i.e.*, the Human Health. But means under each system differ. The basic thought contents under these subjects are also the same. Same is the case with the class Philosophy. Western Philosophy, Indian Philosophy, Chinese Philosophy, etc., are the systems under it. They cover almost identical issues but from different points of view. This feature in the development of knowledge involves a notational problem, *i.e.*, how to amplify a class in relation to the various systems or schools under it ?

Another feature in the development of knowledge is that certain sub-areas of a subject become the classes of specialisation. All issues regarding them are sought together, produced mostly in one document and often referred to as a group. This feature of knowledge also demands its own notational match. These features have been recognised by Ranganathan and he calls them amplifying facets of kind 1 and kind 2, respectively. In the verbal plane he names them SYSTEMS and SPECIALS, respectively. We shall discuss them one by one.

SYSTEMS

Appearance of systems in subjects. Edition 1 of Colon Classification contained certain terms like School of Thought, Hypothesis, etc. These terms were later on converted into the term Systems by Ranganathan. The terms Schools of Thought or Systems indicate that a particular subject has been viewed from different approaches. The number of systems will be equal to the number of approaches, and under each approach the whole range of the subject is treated, *e.g.*, under Education,

Montessori approach ; under Economics, Marxist approach ; under Physics approach through the principle of Relativity ; under Psychology all issues being examined through the concept of Psycho-analysis. These examples, reveal that under different subjects, the entire area can be examined from the point of view of established schools of Thought or Systems.

Definition. To Ranganathan the term system still evades a clear-cut definition and, therefore, he takes it to be an assumed term. in Depth Classification (12), *An Libr Sc 1955*, he says—

“An exposition of a subject can only be according to some system. In other words, there can be no document on a Basic Class qua Basic Class.”

By this statement of Ranganathan it becomes obligatory that the exposition of a subject should be according to some system. He also feels that the concept of system is intrinsic to the universe of knowledge itself. This means that systems and system facets exist in the idea plane. The canon of helpful sequence will demand that all the documents according to a particular system should be placed together.

Verdict of Scientific method. In order to be sure about the existence of systems, Ranganathan puts the issue for examination by the spiral of the scientific method. His findings can be summed up into the following :—

Facets of experience are reduced to empirical laws often with the aid of the intellect. Empirical laws are refined into the Fundamental laws. Certain laws are deduced from the Fundamental laws. Here all the empirical laws reappear and in addition to them, we find certain other laws, which are also deduced, but these deduced laws differ from the empirical laws. Such newly deduced laws are tested by reference back to experience. Often it happens that the newly deduced laws fail in the test, but sometimes, through deduced laws, altogether new facts are experienced which are not in conformity

with the Fundamental laws. The issues are carefully examined, and if the need be, the new set of Fundamental Laws is formulated, with which, a system appears. *A system, therefore, originates if the new set of Fundamental Laws is created. One system differs from another system of a subject because their fundamental laws differ.*

Analysis of System. The mere recognition of systems was not enough. It was necessary to find out as to which facet of a Basic Class, it should belong to? As CC has only five categories, it was compelled to select one out of the five. Time, Space, Energy and Matter, because of their different jurisdictions, cannot accommodate it. Therefore, it was deemed to be a manifestation of Personality. Personality found it convenient to allot to it its first Round. As the levels of this round of Personality were already occupied in the second zone, *i.e.*, Arabic numbers, they were analysed by symbols of the first zone, *i.e.*, lower case letters which gave them a place anterior to symbols of the second zone.

Example :

Idea Analysis	BC	IPa	1P1	E
Term Analysis	Main Class	System	Personality	Energy
Kernels	Medicine	Homoeopathy	Digestive system	Disease
Numbers	L	L	2	4
Connecting Symbol		Not needed	,	:
Synthesis	LL, 2 : 4			

Notational provisions. These findings in the idea plane were to be provided for in the notation of a scheme. Along with the systems, Ranganathan also recognised Branch Systems and Specials. All these were accommodated under Personality in first round. As the second zone was already occupied by the traditional levels of first round Personality, new findings got the first zone for their symbolisation in the following manner :

Example :

Personality						
First zone			Second zone			
1Pa	1Pb	1Ps	1P1	1P2	1P3	1P4

When the new findings were placed under the first zone of Personality, the following rules were adopted.

- (i) The system level should precede all other levels of the personality facet.
- (ii) The special level should succeed the system level but it should precede the rest of the levels of personality facet.
- (iii) If the system, special and personality isolate numbers appear in a class number, a comma each should be used to connect Special and Personality numbers. If only Special and Personality isolate numbers appear, a comma should not be used before Special isolate number but it should be used before the Personality isolate number. If only Personality isolate number occurs, comma need not be used to connect it, as is the general practice.

Examples :

- (i) LL, 9C, 2
- (ii) L 9C, 2
- (iii) L2

Favoured systems. Another assumption which Ranganathan made was that one system out of all the systems, will have the highest literary warrant at a particular point of time. The source of this assumption appears to be the present day supremacy of allopathy (in literary warrant) over other systems of medicine. This meant that one system in each class will be the favoured system. Therefore, the favoured system was identified with the Basic class number itself. In Medicine, Allopathy is not enumerated under systems. The main class number L itself stands for it. All documents from allopathy point of view are accommodated under the main class number. The result is that the books on allopathy precede the books on other systems in their arrangement.

Numbering of systems. All the system isolates, excluding the favoured system, in a Basic Class, are given the notational digits according to the Chronological Device. The time of the origin of the system is the characteristic used for it. For example, in Economics—

XA Systems

XB War Economics	(Originated between 9999 to 1000 BC.)
XM Co-operative	(Originated in the 19th century.)
XN16 Syndicalism	(Originated in 1916.)
XN17 Communism	(Originated in 1917.)

Systems are not the creation of CC. They exist in the universe of knowledge. DC and UDC, both recognise

them in their notation. There, they are enumerated in a disconnected manner in the schedules. CC has consciously recognised the System Facet and has given certain schedules of systems. The result is that all documents on a system can be put together.

SPECIALS

Specials of a Basic Class are those isolates under which people specialise. Under them the entire subject is viewed from the point of view of the field of specialisation. Such subjects came in greater prominence about 50 years ago. Ranganathan analysed that the specials signify restriction on the field of exposition of a subject to a particular range. CC has enumerated a list of specials under different classes, for example :

In Medicine	In Physics
L9A <i>Specials</i> ✓	C9A <i>Specials</i>
L9C Child ✓	C9B1 Molecular Ray
L9E Old Age ✓	C9B2 Atom
L9F Female ✓	C9D1 Low Temperature
L9H Tropical	C9D8 High Temperature
L9T Aviation	Etc.
L9V War	
L9X Industrial	

Each special mentioned above, views the subject from its own angle and covers the entire area as a specialist's concern. A specialist on child medicine will be interested in the study of all organs [P] of the children's body, and all the problems [E]. He will not be equally interested in the organs [P] and problems [E] of old age or female medicine, and vice versa. The canon of helpful sequence demands that all documents on a specialised area should be put

together. To do so, CC adopted them in the penultimate sector of zone 3 and enumerated them with the help of the digits, from 9A to 9Z. The Roman capitals were allotted to the special isolates in an enumerative manner. The place value of specials was assigned after the systems and before the PMEST. Therefore, PMEST of a Basic Class are available for use as sub-divisions of the specials.

Examples

- L9C,2 —Digestive system of children.
- L9C : 4 —Diseases of children.
- LL, 9C, 2 : 4 : 6—Treatment of the diseases of digestive organs of children according to Homoeopathy.

The concepts of systems and specials proved useful in the theory of knowledge classification. One finds them in the structure of knowledge. They are also available in all schemes of classification. DC and UDC have treated them like other isolate ideas but Colon has gone a few steps ahead. In their gradation as units of knowledge, Colon treats them wider than isolates and facets. They command a position like that of a quasi-basic class with the result that all the facets and their isolates are available for sub-division under a system and a special, just as they are available under the Basic Class. This is a unique provision and it is because of this state that Ranganathan calls them amplified basic classes of kind one and kind two, respectively. There is an additional feature of the systems and specials. Systems and specials also exist even on single isolates of facets under basic classes. Suppose the isolates are production, distribution, etc., under Basic Class Economics. There are different systems existing on these isolates. In the same manner, specials may also exist on individual isolates. As they become more prominent in the exposition of knowledge, the devices used in case of the systems and specials of basic subjects can also be used in case of the isolates. In fact, Colon has started doing it, *e.g.*, 3A

systems by (CD) under isolate Distribution of [E] in (BC) Economics. Keeping in view these trends in the development of knowledge, the concepts of systems and specials are bound to be a promising device in the notations of schemes of classification.

ZONE ANALYSIS

A detailed examination of the concept of Zone Analysis is again beyond the scope of this book. We will give only an elementary treatment to it. Zone Analysis deals with the examination of possible number of zones of ideas in the structure of knowledge in arrays of different orders. Ranganathan arrived at this concept through an indirect method. While devising the scheme of classification he did not explicitly approach the field to find out the possible zones of ideas in knowledge. It is just in making the attempts for the provision of classes in the notation, through the concept of hospitality, where he created four zones, then suddenly he was able to equate each notational zone with the zone of ideas existing in the structure of knowledge. The moment he was able to find identical zones in idea plane and the notational plane, the principle of Zone Analysis emerged.

Concept in Idea Plane. The thesis of this concept is that in each array of ideas and isolates of any order, there are four types of ideas and isolates. Therefore, four types of zones exist in each order array. These four types of ideas fall under two major groups of ideas. They are :

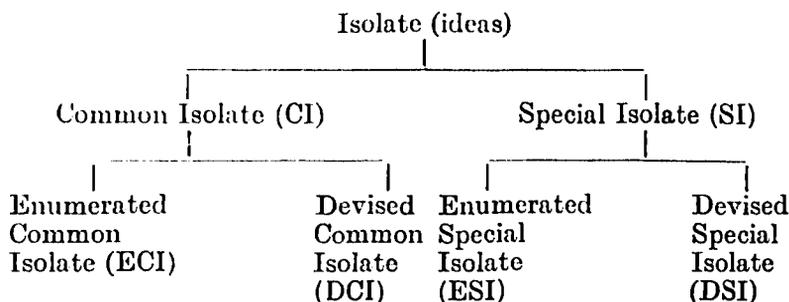
- (i) Common Isolate Ideas, which are common to many subjects.
- (ii) Special Isolate Ideas, which are special to a class.

Each major group falls under two sub-groups which are :

- (a) Notationally and verbally enumerable in the chart of knowledge.

(b) Notationally and verbally (not enumerable but) devised.

In other words, one group is of Enumerated Common and Special isolate ideas and the second group is of Devised Common and Special ideas. Following is the diagrammatic representation :



Ranganathan suggests that the sequence of these zones in an array should be as follows—

Sequence No.	1	2	3	4
Zones in an array	Enumerated Common Isolates	Enumerated Special Isolates	Devised Special Isolates	Devised Common Isolates

Provision in Notational Plane. For each zone of an array of isolate ideas it is necessary that different types of digits are used in the notational array, for creating four zones there as well. CC has used the following four types of digits in its notation :

1. Roman smalls ;
2. Arabic Numerals ;
3. Roman capitals ;
4. Packeted Numbers.

CC notation is at-one-ment with the types of zones of isolate ideas in knowledge. The following table shows the at-one-ment.

ZONES IN AN ARRAY OF FIRST ORDER

1	No. of zones	1 Zone		2 Zone		3 Zone		4 Zone	
2	Symbols	ECI		ESI		DSI		DCI	
3	Types of Isolate ideas	Enumerated Common Isolates		Enumerated Special Isolates		Devised Special Isolates		Devised Common Isolates	
4	Types of Notational digits	Lower case Roman letters		Arabic numerals (starting with)		Roman capital letters		Packeted Notation, i.e., number in brackets	
5	Examples of Notational digits	a b c d... x y z		1 2 3 4 5 6 7 8 9		A B C D E... X Y Z		() ()	
6	Examples from the Array of Main Classes as given on page 2.4 in 6th ed. of CC	Class No.		Class No.		Class No.		Class No.	
		Generalia class	z	Universe of knowledge	1	Classes from Mathematics	B	Criticism technique	(:g)
				Lib. Science	2	to	to	Conference technique	(p)
				Book Science	3	Law	Z	Communication theory	(P)
				Journalism	4			Management	(X)

Column 6 in the above table reveals full understanding between the zones of isolate ideas of first order array and the zones in the CC notation. The same position can be found in any array of CC notation. In the second order array, we find the same position.

Zones of Classes in Second Order Array

1 Zone	2 Zone	3 Zone	4 Zone
Generaliaza Bibliography	Indology z44	Gandhiana zG	Jainology z(Q3)

If we ignore the lower case z which is common in each zone number, one will find that the various members belong to their respective zones.

In the same manner four zones can be found in a facet and even in isolates. The consequences of the presence of four zones under any order of array are the availability of enormous hospitality in array and clear-cut understanding of the ideas and numbers of zones. One can note the utility of the application of zones under the isolate 'Labour' of [E] in Economics. In absence of this provision, the isolate 'Labour' would have been difficult to be managed in the schedule. The third advantage is that any isolate idea can be fully individualised. The concept of Zone Analysis proves in full the necessity of mixed notation. Because of these advantages, Zone Analysis occupies a very important place in the classification of knowledge for documents.

AUTONOMY TO THE CLASSIFIER

Need for Autonomy. The word autonomy means the power or right of self government. The self government in case of a classifier is that he should himself be able to perform the act of classifying. Ordinarily the classifier is able to classify with the help of a Code or a scheme of classification, but when an issue falls out of the coverage

of the Code, or the scheme, he faces difficulties in performing his duty of classifying. Such situations often arise, because the developments in knowledge and in its exposition are an everyday affair. To this Ranganathan says that knowledge repeatedly throws forth new subjects here, there and everywhere. On the other hand, the editions of a scheme of classification cannot appear everyday or every year and so the things cannot wait for years for guidance on new issues. Secondly, the classificationist too has his limitations. He cannot foresee all kinds of combinations and permutations in the exposition of knowledge in documents. Individual documents possess typical features. These features are so many in number that the classificationist cannot realise all of them. Therefore, the need arises that the classifiers should themselves be able to handle such typical situations. For a successful handling of the situation by the classifiers, it is necessary that certain general rules, tools and devices be provided in a scheme. These rules, tools and devices will help in the maintenance of utmost uniformity by the classifier at different places. The rules, tools and devices will work as guiding principles for the classifier. Before we examine these devices, etc., it should be clearly understood that autonomy to the classifier means the performance of certain duties by the classifier which actually fall under the jurisdiction of the classificationist. As it is an important power, its delegation should be done through clear understanding between the classificationist and the classifier, certainly under the former's guidance.

How of Autonomy ? Having agreed that the fear of blockade in or postponement of classification of documents demands that the classifier should be able to perform his duty, the question arises, how can this be done ? The answer to this question lies in the analytico-synthetic pattern of classification. A scheme capable to analyse and synthesise in full, should be able to do it. The provision for hospitality in array and chain ; possibility to indicate different types of relations and locations ; provision to specify the temporary occurrence ; use of seminal mnemonics ; exhaustive treatment of common isolates ; and guidance from postulational approach, etc.,

provide sufficient autonomy to a classifier. The most important contribution of these rules, tools and devices is that they train the minds of the classifiers to understand properly the situations involved in a document or in a specific subject. Once a clear analysis is arrived at, the search for solution is not difficult. One should find it encouraging that certain students of Ranganathan would be able to arrive at same numbers for certain new topics.

Autonomy in CC. CC is a scheme built on the concept of analysis and synthesis. It divides its working in the three planes and has accordingly piled up a number of rules, tools and devices, which deal with the problems in different directions. The notational techniques of CC match with all possible features of knowledge. Therefore, it is not difficult for a classifier to maintain his autonomy by working with CC.

Autonomy in DC. One should not expect much of autonomy in DC because its pattern is enumerative. There are not much of tools or devices to make its corpus. The provision of analysis has been hidden under it. Synthesis techniques are poor. Hospitality in array and chain is limited. Need for the indication of relations is beyond its scope. Indication of temporary incidence of isolates is possible only partially. Treatment of common isolates is confusing. And complete testing through postulates is impossible. Under these circumstances autonomy to the classifier is not much possible. But DC has other advantages. It has got a huge organisation behind it. Periodical lists of additions and alterations are published. Index is almost exhaustive. Various National Bibliographies are classified according to it. Different guides, although not very clear, like Merills Code, Library of Congress Guide, etc. exist. Therefore, it is not difficult to find out the number of new classes according to it. No doubt the individual classifier can do little himself for a new number. In spite of all that are mentioned above, the DC is not completely devoid of autonomy to the classifier. The following devices provide for it :

(i) **Scheduled Mnemonics.**

- (ii) Decimal fraction device.
- (iii) Gap device.
- (iv) Relocation device.
- (v) Alphabetical device.

It is through these devices that DC is also able to maintain some autonomy to the classifier.

Autonomy in a scheme of classification is a necessity. CC has been able to provide for it in a better manner because its origin is later in time, by virtue of which, it could improve over other schemes. The real purpose of autonomy is that a scheme should be self-perpetuating. It demands that each new subject should bring its class number in its pocket.

PART V
ON
DOCUMENT NUMBER

“The call number of a book (number by which it is called for) generally consists of both class and book numbers. The same class number applies to all books on the same subject; the book number distinguishes each individual work from all others in that class, and is the same for all volumes or copies of same work.”

—MELVIL DEWEY.

1. SETTING THE PROBLEM

Purpose. The purpose of classification in a library is to see that each document bears its own individual number. In other words, no two or more documents should have the same number. If this state of 'each book its own individualising number' is not maintained, the disorder will prevail in a library. For example, if there are twenty books on a specific subject, all the twenty books, as their unit of knowledge is same, will be assigned the same class number. The question arises as what will be the sequence between these twenty books? When we ask the knowledge classification it seems to say—"I am sorry. My role is over. As all the books are on the same specific subject and they possess the same class number, no technique in me (*i.e.*, knowledge classification) is available to individualise these books." When such an answer is received from the knowledge classification, the classificationists and the classifiers are forced to depend on the physical features and other attributes of documents, for the sake of individualisation of each book. Such features of a document are :

- (i) Language in which the document is written,
- (ii) Form of the document,
- (iii) Author of the document,
- (iv) Year of Publication of the document,
- (v) Accession number of the document,
- (vi) Volume number of the document,
- (vii) Supplement number of the document,
- (viii) Copy number of the document,
- (ix) Relation number of the document.

If one (or as many as required) of the above features is adopted and a number for the same feature is given, the individualisation of each document will be achieved.

Meaning of Book Classification. Sayers recognised these features and indicated them by the terms: (i) Inner Forms, and (ii) Outer Forms ; of books. Systems like Author marks, Biscoe numbers, Cutters numbers, etc. were used for this purpose. Ranganathan while recognising this, divided the library classification into the following three areas :

- (i) Knowledge classification *i.e.* Class number,
- (ii) Book classification *i.e.* Book number,
- (iii) Sequence classification *i.e.* Collection number.

These three areas together make the library classification, wherein it is possible to individualise each and every document irrespective of the number of documents a library may have. This situation can be represented into the following equation :

$$\text{Library classification} = \text{Knowledge classification} + \text{Book classification} + \text{Sequence classification.}$$

Librabry classification means (=) Call number of documents.

$$\text{Call Number} = \text{Class number} + \text{Book number} + \text{Collection number.}$$

But at the same time, the meaning of Book classification and book number has been taken differently, particularly in the West. In Sayers, *Introduction to library classification*, we find a very interesting discussion on the difference between Knowledge Classification and Book Classification. This has been discussed by Sayers¹ in a classic manner, "a classification of books is a classification of knowledge with adjustments conditioned by the physical

1. Sayers (WCB) : *Introduction to library classification*, p. 42.

form of books". The meaning of this statement can be represented in the following equation :

$$\text{Book classification} = \text{Knowledge classification} + \text{Certain adjustments.}$$

Sayers included the following under '*certain adjustments*' :

- (i) Generalia class.
- (ii) Form classes and divisions.
- (iii) A notation.
- (iv) An index.

Now, let us examine the various meanings for which Ranganathan and Sayers have used the term 'Book classification'. Ranganathan's use of book classification deals with the physical features of documents. Sayers means, by book classification, all that we do to classify a book. Here it is a confusion in the verbal plane. The following equation will clarify that both of them mean the same thing in the idea plane :

$$\text{Sayers 'Book classification'} = \text{Ranganathan's 'Library classification'}$$

$$\begin{aligned} \text{Ranganathan's 'Book classification'} \\ = \text{Sayer's 'a part of Form} \\ \text{classes and divisions'} + \\ \text{'Author marks'}. \end{aligned}$$

This difference in verbal plane is one of the reasons for the preference to the term Document Number as the heading of this chapter. The following illustration will give a general picture of the problem in right perspective :

<p>Documents contain the units of knowledge. They possess certain physical features and are arranged in different sequences in a library.</p>	= {	<p>To Ranganathan : Class number + Book number + Collection number</p> <p>To Sayers : Knowledge classification modified to suit books + Author marks + Sequences,</p>
---	-----	---

The basic thing to remember here is that at a particular stage in the process of individualisation of documents or books, the classification of thought contents is joined by the classification of the physical features, etc., of documents. This may be said to be either the Book classification, or Document classification, or the classification of the physical forms of books, or even classification by author marking, etc.

Ranganathan² has explained its role in the following words :

“The book number takes up the individualisation of books (documents) at the point where the class number has to leave it beyond its power.”

2. Principles for Document Classification. For dealing with this area of library classification, we require guidance from certain principles, in the same manner as we were guided under knowledge classification. Ranganathan has expounded the following canons for this area :

- (a) Canon of Classics
- (b) Canon of Local Variation
- (c) Canon of Book Number
- (d) Canon of Collection Number
- (e) Canon of Distinctiveness.

These canons are based on the special features of the universe of documents. The features are—(1) Quasi class ; (2) Local variation ; (3) Composite documents ; (4) Form or Medium of expression ; (5) Related Documents ; and (6) The Physical structure of documents. (Partial Comprehension has been excluded here.) These special features are dealt with by the set of these canons. Let us take the canons one by one.

(a) **Canon of Classics** : Experience shows that certain documents on a particular specific subject, become more important than the rest of documents on it. This is

2. Ranganathan (SR) : Prolegomena to Library Classification, p. 371.

obvious. If hundred persons write on a topic, some will produce more important works and the rest, less important works. A few out of those who produce important works, will present very very important works than the rest. The works of these (a few persons) will become classics on a subject. Because of certain peculiarities of classical works, they require special treatment in classification. The way in which this special treatment is accorded may be called the 'Classic Device'. This casual definition does not mean the absence of a technical definition for it. Ranganathan has defined it in his *Prolegomena*. He has analysed the following three features of classics :

- (i) It has elements of permanent value.
- (ii) It is saturated with the personality of the author, which in itself is very powerful and highly organised.
- (iii) It is a seminal book cutting new grounds, blazing new trail, stimulating new thought, and so on.

The law of literary warrant justifies the need for special treatment to such documents. The treatment has been best defined by Ranganathan in his following Canon of Classics :

“A scheme of book classification should have a device to bring together all the editions, translations and adaptations of a classic, and next to them all the editions, etc., of the different commentaries on it, the editions, etc., of a particular commentary all coming together and next to each commentary all the editions, etc., of the commentaries on itself in a similar manner (commentaries of the second order), and so on.”

The simple implication of this canon is that the documents on a classical work should be arranged in a helpful manner. A question may arise that the topic of classics should fall under the Knowledge Classification, and not under Book Classification or Document Classification. A simple answer to this question is that the moment we

reach the stage of ultimate class, and there is still the need for further individualisation or differentiation between the documents on that ultimate class, there, the jurisdiction of knowledge classification is over and the area of book classification starts.

Classic Device in CC. With the help of the method of dividing the work into three planes and by exploiting all about document classification into three areas *i.e.*, knowledge classification, book classification and the sequence classification ; Ranganathan was able to understand the problems of classics in the idea plane and he provided for them in the notational plane. The entire purpose of Classic Device in CC is to secure conformity with the Canon of Classics.

In CC the Classic Device consists of sub-dividing ultimate classes by the lower case digit x. This lower case x is the symbol for classics as a class. There are certain facets employed to further sub-divide the classical class. The facet formula is :

x [P1], [P2], [P3], [P4]

P1 = Classical author, to be got by the Favoured Category Device and the Chronological Device.

P2 = Classical work, to be got in the manner of P4 in main class 0 Literature.

P3 = Commentary number, to be got by the Favoured Category Device and the Chronological Device.

P4 = Sub-commentary number, to be got by the Favoured Category Device and the Chronological Device.

Example :

R 621x1,1,1,4==A work by SRIDHARA ; its title is 'Nyaya Kandali'. It is a sub-commentary on the commentary by PRA-SASTA-PADA ACARYA on the basic work of KANADA'S title *Vaisesika-sutra*.

So, the interpretation of the number is—

Class No. R21 = Vaisesika Philosophy

Symbol for

Classics x = Classical works on this class

P1 1 = The first author who wrote the classical work on it *i.e.* KANADA

P2 1 = The first classical work by KANADA, *i.e.* *Vaisesika-sutra*

P3 1 = First classical commentary on KANADA'S *Vaisesika-sutra i.e., Padaratha Sangraha* by PRASASTA-PADA ACARYA

P4 4 = Fourth sub-commentary on the commentary in *Padaratha Sangraha* by PRASASTA-PADA ACARYA on the basic work '*Vaisesika-sutra*' written by KANADA.

The advantage of Classic Device in CC is that the classic becomes a class by itself and through its facets the helpful sequence between the documents is possible. If this device in CC is ignored, the relevant documents on a classical work will get scattered at different places in the ultimate class. The arrangement so got in CC is of evolutionary sequence. The digit, lower case x is in no way in conflict with the use of the same for collections on a subject, the Common Isolate, because the latter will not be subdivisible by the same facets as of the classics. Secondly x as a classic will be subdivisible by the Arabic numerals; and x as collected works will be subdivisible by the capital letters indicating the year of the birth of the youngest author in the collection (*e.g.* No. Y31 x M48 stands for collections on Rural life and the youngest author whose work is included was born in 1848) there will be no confusion between the two uses of the digit x. No problem arises in case of the collections of the same author.

Classic Device in DC. We have just now established that the Classic Device does not fall under knowledge

classification. Its place is Book classification. It should be noted that DC is not a scheme dealing with the physical and other non-knowledge features of the documents. Therefore, the DC should not be expected for the provision of Classic Device. On the other hand, the Author marks or Cutter number, etc., should be expected to provide for it, because it is they who supplement DC as Book classification. Still, the DC has not failed to provide for such a feature in it. The fact is that various features in every scheme of classification are doing the identical work as done by Classic Device in CC. These features or places in other schemes including DC are the following :

(i) Handling of sacred books.

In DC we find that the provision for individualising sacred books exists under :

Bible	220
Comparative religion	291.82
Hinduism	294.592

All books on the Bible or the Holy Koran, etc., get the same number and are placed together. Although further individualisation cannot be achieved between these books, the provision exists, at least, for putting the relevant things together.

(ii) Classics in the field of literature also get together on the shelves.

(iii) As DC is an enumerative classification, where each minor class has been individualised, it is not difficult to put together all the classical works on a specific subject, *e.g.*, classical works on the blood medicine will go to 616.15.

Application of the entire facet formula for classics, as is in CC, is impossible in DC. Therefore, the result is the mixing up of classical works and non-classical works on a ultimate class. However, the absence of notational treatment of the classics in DC is not a weakness of DC

because it deals only with the knowledge classification and not with the document classification.

It is indisputable that CC has provided for the Classic Device in a suitable and in a scientific manner. A library specialising particularly in indology should employ it, so also be done by the research libraries, which have to individualise the comments, etc., on great research works of eminent scientists. This device creates a kind of a quasi-class, because there are certain characteristics on the basis of which, facets are recognised to divide and sub-divide. The availability of the classics is a feature present in the universe of documents, which CC has recognised and has duly provided for. DC is, however, not a great loser by not providing for it because of the advantages of the exhaustive enumeration and also because DC refuses to classify in detail while the Classic Device individualises at the extreme end of the chain.

(b) **Canon of Local Variation.** The provision for local variations is necessary because variations exist from a country or a place to another country or a place. Dewey, Bliss and Ranganathan have provided for it in their schemes in one manner or in another. Apart from facilitating the sequences of national or local interests, the local variation gives a scheme an international character. Ranganathan defines the canon in the following manner: "The notational system of a scheme of book classification should provide for variations due to special interests."

It may be noted from Ranganathan's statement that the Canon has a bearing only on the notational plane. It does not come into the picture in the idea plane. It is through the provision of local variation that a general scheme of classification can also be used for special libraries and their readers. The local variation gives flexibility to the notation. The need for the provision of local variation will, however, be most useful to the national interests. Keeping this fact in view Bliss said, "Adaptation to nationality should in a standard system be liberal even to a radical alteration. This may in some cases be modified by alternative location reserved or provided. For history and literature these provisions are especially

requisite." Suggestion by Bliss for alternative locations for local variations was not a sound proposition. A better way was shown by Ranganathan when he provided for the classes like Mother Country and Favoured Country to digits 2 and 3, respectively. Sayers³ advocated for it, and mentioned that, "The local classifiers' object is to produce a detailed scheme with brief notation.... Economy in notation is got by substituting S for Surrey instead of 842.21 in Dewey....." Cutter provided for local lists in his Expansive Classification. The simple meaning of local variation is that a scheme of classification should see that the class numbers of documents, in the countries all over the world, should be convenient to the respective countries in the length of digits and orders of the classes of local interest.

Local Variation in CC. The advantage with Colon is that it was invented after the need for local variation was sufficiently given thought to. Therefore, Colon provided for local variation in a suitable manner. The places in CC where this canon is explicitly respected, are :

- (i) Under Geographical divisions.
- (ii) In case of the favoured language of a library.
- (iii) Under philosophical systems.
- (iv) In case of the favoured subjects of a specialised library.

(i) Under the Geographical divisions we find the following distribution of the digits :

- 1 World
- 2 Mother country
- 3 Favoured country
- 4 Asia
- 5 Europe
- 6 Africa
- 7 America
- 8 Australia

Digits 2 and 3 respect the canon of local variation. Any country falling under the divisions 4, 5, 6, 7 or 8 can utilise the digit number 2 for the mother country, and by doing so, place the documents on the mother country before all other countries irrespective of the original place of the mother country under the relevant continent. For example, India is 44 under Asia. Ordinarily, the History, Law, etc., of India will come after the History, Law, etc., of China and Japan. But by adopting the digit number 2, the documents regarding India, under different subjects, will come before all other countries.

(ii) For each library, literature on a particular language, and other documents in a particular language are most important than the rest. For example, English Literature is the most popular one in Great Britain. Ordinarily its number will be O111, but under Colon, the hyphen - is prescribed for replacing the number of the favoured language. So, for libraries in Great Britain the number for English Literature will be O - . The result will be that on the shelves, because hyphen - is of least ordinal value, the documents on English literature will be placed first of all. This is in conformity with the requirements of the Canon of Local Variation.

(iii) Under Philosophical systems in CC, we find that after the division of Philosophy under its canonical classes up to digit 5, the digits 6, 7 and 8 have been used as follows :

R6 Favoured System I

R7 Favoured System II

R8 Other Systems (GD)

The libraries of a country can adopt the digit 6 for the philosophical system of that country. The digit 7 can be used for the philosophical system of second importance to a country and under digit 8 will fall the rest of the philosophical systems. This provision will suit the libraries in any country by providing the first place to its own system of philosophy. For example, in India, the digit 6 will be assigned to Indian Philosophy, digit 6 in China will

be assigned to Chinese Philosophy. Digit 7 can be assigned to the most related philosophy with the philosophy of a country. This is an excellent provision in CC.

(iv) An other important feature regarding this Canon in CC is that for the subject of specialisation of a library. It provides the first place to the documents on the subject of specialisation. For example, in Indian Council of World Affairs Library, suppose, the class number for its special subject is V2 : 19. This class number has its own ordinal value in the scheme of classification. In order to give first place to this Class Number, so that documents on it are arranged before others, the hyphen can be used to replace the entire class number *i.e.*, V2 : 19. In this manner any special library can use the hyphen - to replace the number of the subject of its specialisation, and by doing so, the library can place first of all, the documents on its special subject, irrespective of the ordinal value of its class number in the scheme of classification.

Another advantage of these four types of provisions for local variation in CC is that it reduces considerably the length of the notation which a class number will otherwise have. Canon of local variation has been respected in CC in a comprehensive manner by virtue of which CC becomes the first scheme to honour the canon to such a great extent.

Local Variation in DC. As already indicated, the provision of local variation in a scheme is necessary for making it universally acceptable. We all know that DC is the scheme adopted by most of the libraries in the world. Therefore, it is obligatory on DC to be able to provide for local variations in its structure. Ranganathan, in his *Prolegomena*, has mentioned the attempts made by Wm Alanson Borden for modifying DC to provide for local variation in its structure. After the death of Melvil Dewey, probably the idea of introducing the elements of local variation in DC could not get sufficient support. But the need for it did not die out for ever. In the winter of 1960-61, Mr Swank, incharge of the external affairs of the American Library Association, made a world wide tour to

study the needs of other countries for special provisions in DC scheme. In his discussion with me in the University of Delhi (where I was teaching Classification), I requested him to introduce good number of changes to provide for local variations in DC structure. The subjects like Religion, Literature, Language, History and Geography contain majority of books in any general library, anywhere in the world. As the present structure of DC is from American point of view, the libraries of other parts of the world are bound to face difficulties in classifying documents on above subjects by DC. Let us see what changes are introduced, if any, in the forthcoming 17th edition of DC. As the situation is in the 16th edition, instead of the provision for local variation in it, we find local exclusion, so to say, particularly under the classes Philosophy, Religion, Language, Literature and History. The subdivisions of these subjects, for use in Asian and African countries, are being handicapped.

(c) Canon of Book Number :

The Canon of Book Number has been defined by Ranganathan as follows :

“A scheme of book classification should be provided with a scheme of book numbers to individualise the documents having the same class of knowledge as their ultimate class.”

Sufficient thought has been given to this problem in the beginning of this chapter. Let us examine the various methods for individualising the documents under the same specific subject. The following are some standard practices :

- 1 Writing first three alphabets of the author's surname ;
- 2 Translation of the author's name into an ordinal number ;
- 3 Translation of the year of publication of documents ;
- 4 Translation by the Colon Book Number system.

1. The simplest possible method to individualise books on an ultimate class is to write the first three alphabets of the author's surname. Let us take an example, suppose there are four books on Economics by the following authors—

Book on Economics by :	CC No.	DC No.
	X	330
Basu (A N)	Bas	Bas
	X	330
Jones (R T)	Jon	Jon
	X	330
Tandon (B P)	Tan	Tan
	X	330
Tandon (R S)	Tan	Tan

This method will fail to individualise documents if there are two or more authors of the same surname, or if there are more than two works by the same author on the same specific subject. The method will also not individualise between the different editions of a book and different volumes of books in case of number of volumes.

2. Translation of author's name into ordinal numbers became popular in the West. Four important leaders of the profession—Cutter, Merrill, Jast and Brown—worked out different translating systems. The method that they adopted was to translate the author's name into digits either mixed or pure, for example :

In Cutter's Book Number : G16 is the book number where author's surname is Gardiner. Adoption of first two alphabets is also found in Cutter's numbers.
(He adopts mixed notation)

In Merrill's Book Number : 15 is the book number where author's surname is Carr.

According to these systems as well, it is not possible to individualise documents if the surnames of the authors of books on a subject are the same, or in case of different

copies of a work, and different editions and volumes of a book. Ranganathan feels that the attempt on the part of these four leaders of the profession to work out the systems of this type, was a waste of their time and efforts.

3 A more utilitarian method was adopted under Biscoe Numbers. It ignored the name of the author for individualising documents and in its place adopted a chronological table to translate the year of the publication of the documents. This was a step in a new direction, which virtually adopted the evolutionary sequence among the books. Books which appear before, often influence the books which are written later on. According to this method a book published earlier is put first, and a book published later on is put afterwards. The Biscoe table is given below :

A Before Christ	G 1800—1809	M 1860—1869
B 0—999	H 1810—1819	N 1870—1879
C 1000—1499	I 1820—1829	O 1880—1889
D 1500—1599	J 1830—1839	P 1890—1899
E 1600—1699	K 1840—1849	Q 1900—1909
F 1700—1799	L 1850—1859	R 1910—1919

Suppose three books appeared on Political Science :

	CC No.	DC No.
One in 1899	W	320
	P9	P9
Second in 1907	W	320
	Q7	Q7
Third in 1913	W	320
	R3	R3

The sequence of these books will be as follows :

	W	W	W
CC No :	P9	Q7	R3
	320	320	320
DC No :	P9	Q7	R3

The possibility of individualising more than one book on a subject, if published in a year, was available under Biscoe number, by adding lower case letters. This was a great contribution to the theory of book number and its influence is apparent on Ranganathan's book numbering system.

(iv) Ranganathan, as usual, analysed the problem in its full and thus for book classification he worked out a facet formula. The facet formula is given below :

[L] [F] [Y] [A]. [V]—[S] ; [C] : [Cr]

These eight facets may appear more troublesome to look at than the facets of P M E S T. But one should note that all these eight facets will be applicable together only to about 5 documents in a library of about 1,00,000 books.

Most of the books will require only [Y] facet. The meanings of these facets are :

L—Language in which the document is written.

F—Form of the document.

Y—Year of publication of the document.

A—Accession number part of the document.

V—Volume number of the document.

S—Supplement number of the document.

C—Copy number of the document.

Cr—Criticism number of the document.

Use of [L] facet will be required if the books are in languages other than the favoured language of a library. Many libraries prefer to have altogether a different sequence under different languages; where language number will be a part of the sequence number. Use of [F] facet will also be rare. [Y] facet is the *major-domo* (facet with the responsibility of general management) here. It will find place under each book. [A] facet will come if more than two works on a subject have appeared in a year. [V]—[S] will appear if the document is in many volumes

or is appearing in supplements, respectively. [C] facet will be required because the number of copies of a book is often more than one. [Cr] facet will be required to indicate that one work is in criticism or attached to another work on the same subject.

Through these facets, Colon is in a position to individualise each document in a library. No two documents will have the same number. Perfect individualisation is possible. Chapter 03 in CC gives rules for their application.

(d) **Canon of Collection Number.** This canon demands that various sequences that are maintained in a library, should be duly specified. The sequences are necessary in a library for prompt services. Each sequence should be given different symbols. Ranganathan has suggested the following symbols for different sequences, examples from CC and DC numbers are also given :

Name of sequence	Collection No.	CC Example	DC Example
Undersize documents	Underline book No.	$\left[\begin{array}{l} X \\ J5 \end{array} \right.$	$\begin{array}{l} 330 \\ J5 \end{array}$
Oversize documents	Overline Book No.	$\left[\begin{array}{l} \overline{X} \\ J5 \end{array} \right.$	$\begin{array}{l} \overline{330} \\ J5 \end{array}$
Worn out books	Underline and overline the book No.	$\left[\begin{array}{l} X \\ \overline{J5} \end{array} \right.$	$\begin{array}{l} 330 \\ \overline{J5} \end{array}$
Rare Book	RB	$\left[\begin{array}{l} RB \\ X \\ J5 \end{array} \right.$	$\begin{array}{l} RB \\ 330 \\ J5 \end{array}$
Reading Room	RR	$\left[\begin{array}{l} RR \\ X \\ J5 \end{array} \right.$	$\begin{array}{l} RR \\ 330 \\ J5 \end{array}$
Text Book	TC	$\left[\begin{array}{l} TC \\ X \\ J5 \end{array} \right.$	$\begin{array}{l} TC \\ 330 \\ J5 \end{array}$
Political Science Department	WD	$\left[\begin{array}{l} WD \\ X \\ J5 \end{array} \right.$	$\begin{array}{l} WD \\ 330 \\ J5 \end{array}$

These symbols or any other sets of symbols can be adopted to complete the process of translation of books for collection numbers. The purpose of the canon of collection number is that books of one collection should be distinguished from the books of different other collections.

(e) **Canon of Distinctiveness.** This canon demands that the number in a call number which fall under 3 areas *i.e.*, Class Number, Book Number and the Collection Number, should be distinguishable from each other, when they are written on a document. Suppose that on the back of a document the following numbers are written :

<i>CC No.</i>	<i>DC No.</i>
RR	RR
X	330
J5	J5

There are three parts in this number and each is distinguishable from the rest. RR is collection number, X or 330 is the class number and J5 is the book number. The canon has an implication on the style of rendering of numbers on a document.

KNOWLEDGE CLASSIFICATION Vs BOOK CLASSIFICATION

This topic has been examined, to some extent, in the beginning of this chapter. As the topic requires examination in detail, it is again taken up here. The diagram on the next page reveals the different approaches which have been made to the topic. The standard term for this topic should be Pure Knowledge classification (*i.e.*, which is not applied for use in classifying documents in a library) Vs Classification of Knowledge for application to documents in libraries. If this view is taken the position will be as follows :

Classification of Pure Knowledge ; not to be used for classifying books in a library, etc.	Vs	Classification of Applied Knowledge ; to be used for classifying documents in a library.
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If the above statement is taken to be valid, the difference between the two shall be the difference between the Logicians' or Epistemologists' interest in knowledge Vs the classificationist, the Librarians' interest in knowledge. Really speaking there shall be no contrast in these interests. On the other hand the librarians' interest will include the logicians' and the epistemologists' interest and in addition to it, certain other items. Sayers⁵ has put it in the following words : "In order to make a classification scheme a practical instrument for the arranging of books the nature of books themselves must be considered." A consideration of nature of books reveals that the following should be added to pure knowledge classification, as Sayers has put it :

- 1 Generalia class.
- 2 Form classes and divisions.
- 3 A notation.
- 4 An index.

⁵ Sayers (W C B) : Introduction to Library Classification, p. 4.

KNOWLEDGE CLASSIFICATION AND BOOK CLASSIFICATION

Position in Ranganathan's thought

Library classification

First view : Library classification = Knowledge classification + Book classification + Sequence classification

Position in Western Thought

Second view : Book classification = Knowledge classification + General class - Certain additions
 Form classes and divisions Notation Index etc.

But Sayers reduces the power of his argument for this phenomenon to half when he says, "A classification of books is a classification of knowledge with adjustments conditioned by the physical form of books." It should be remembered that classification of pure knowledge will run only into array and chain. One unit will not be expounded in relation to another, nor the Common Isolates will come in relation to Special Isolates. All will remain as individual units. While these relations will be required in the classification of applied (or expounded) knowledge in documents. Hence, some important features of these will be as follows :

Knowledge classification (Pure).	Library classification or Knowledge Classification (applied or as expounded in documents).
1 Availability of Basic classes and the isolates.	1 Availability of the Basic classes and the isolates.
2 Helpful Sequence.	2 Helpful Sequence.
3 Array and Chain.	3 Array and Chain.
4 Terms.	4 Terms.
5 No notation.	5 Notation or artificial language.
6 No inter-relations between the isolates of a basic class and between the basic classes in schedules.	6 Incidence of relations between Isolates of a basic class and between the basic classes in documents.
7 No relation between special and common isolates in schedules.	7 Relations between special and common isolates are found in knowledge expounded in documents.
8 In schedule or chart, it is a class, neither composite nor partially comprehensive.	8 In documents, it is written about a class or classes, composite and partially comprehensive.
9 Enormous hospitality exists in array and chain (no notational limitations) of classes.	9 Notational limitations exist in hospitality of array and chain in numbers.

- | | |
|---|---|
| 10 No physical structure, embodying subject, exists. | 10 Physical structure of documents, embodying units of knowledge, exists. |
| 11 No sequences are required. There is only a chart and no physical entity. | 11 Utilitarian sequences of documents are required. |
| 12 No need for an index. | 12 Index is required for reference back to subjects. |
| 13 Place table and devices are not needed. | 13 Place table and devices are required. |

But to certain others, the following are the additional points of confusing difference :

- | | |
|---|--|
| 14 It should have a logical order. | 14 It need not have a logical order, may be even a broken order. |
| 15 It should be evolutionary in sequence. | 15 It should not necessarily be evolutionary in sequence. |
| 16 Need not be in a written form. | 16 Must be in a written form. |
| 17 It should be a current and uptodate statement. | 17 It need not be a current or uptodate statement. |

Points 14, 15 and 17 under library classification deal with the state of the affairs of the Classical Age. Modern age for them lies in the distant future. In absence of logical order (15), library classification will be in a chaos. Absence of evolutionary sequence (16) will put the cart before the horse. Absence of up-to-dateness (17) will throw them back into the past. Feature 16 of Pure Classification of Knowledge, *i.e.*, need not be in a written form, is the monopoly only of God. Because no person today can remember in his mind the details of pure classification of knowledge. Even persons like Plato and Aristotle, in today's structure of knowledge, are bound to feel lost if they ever make an attempt to master just one area of knowledge. The field of entire universe of knowledge is certainly out of bounds, even for them, if they attempt to understand and remember without using the written form of knowledge classification.

APPENDIX A
GLOSSARY OF TERMS

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GLOSSARY OF TERMS

- Alien* : A subject totally irrelevant to the subject sought (Ranganathan).
- Allocation* : Placing one subject in context with, or next to another subject (Bliss).
- Alphabetical device* : The use of the initial-letter (s) of the name of an entity for further division of a class.
- Placing* : A verbal index in which the headings are arranged alphabetically.
- Alternative location* : The allocation of subjects to more than one context in a classification (Bliss).
- Amplified class* : A class expounded according to a special system of thought or subject of specialisation, notationally a main class digit to which a chronological number has been added to indicate systems and penultimate sector 9A to 9Z to indicate specials.
- Analytico-synthetic classification* : A classification which represents a subject by analysing it into its fundamental constituent elements, and synthesizing a class symbol for the subject out of these elements linked by appropriate connecting symbols (Ranganathan).
- Anterior Common Isolate* : Isolate of a subject which demands placement before the subject in a classified sequence.
- Anteriorizing symbol* : Affixed symbol which has the effect of bringing the term symbolized anterior to a term without such an affix (Ranganathan).
- Apupa* : An arrangement in which subjects are in the sequence : alien, penumbral, umbral, penumbral alien, helpful sequence (Ranganathan).

- Array* : The set of mutually exclusive co-ordinate sub-classes totally exhaustive of a class, derived by its division according to some one characteristic (Ranganathan).
- Assemblage, loose* : The formation of a complex or multiphased focus by coupling two or more simple or compound foci (Ranganathan).
- Attribute* : Any property, quality or action of any entity (Ranganathan).
- Auto-biased focus* : A focus which is a scheduled division of a facet further divided by another scheduled division of itself (Ranganathan). Now known as super-imposition device.
- Basic focus* : A main or canonical or amplified main class (Ranganathan).
- Bias* : A relation between phases, the primary phase being studied from the point of view of the secondary or biasing phase (Ranganathan).
- Canon* : A guiding principle derived from the normative principles of a subject.
- Canonical class* : A traditional sub-class of a main class (Ranganathan).
- Canonical sequence* : Not derived on the basis of any definite characteristic ; a traditional arrangement of subjects, for which no underlying principle is discoverable (Ranganathan).
- Category* : A fundamental form or class of concept into which items of knowledge can be grouped.
- Chain* : A hierarchy of modulated sub-classes of decreasing extension and increasing intension derived by successive division leading to a compound or complex class in general or denudation within a facet of any class in particular (Ranganathan).
- Characteristic* : An attribute by which concepts are assembled or divided in classification.
- Chronological device* : The further division of a class by digits expressing date or time.

- Class number* : An ordinal number representing the position of a class in a scheme of classification (Ranganathan).
- Classification* : An orderly agreement of entities in logical division of a subject by means of trains of characteristics.
Notationally to mean an artificial language of ordinal numbers designed to mechanize this arrangement (Ranganathan).
- Classificationist* : One who designs a scheme of classification.
- Collection number* : A symbol denoting any special characteristic (size, physical form, or class of users, etc.) of a group of books, which because of this characteristic must be separately located (Ranganathan).
- Collocation* : Placing closely related subjects in close proximity (Bliss).
- Colon* : In the CC a connecting symbol to introduce the energy facet.
- Common facet* : A facet which can occur in any of several classes of many main classes (Ranganathan).
- Common Isolate* : An isolate common to all Basic classes.
- Comparison* : A relation between phases and isolates of a phase.
- Complex class* : A focus is complex if it comprises two or more Basic classes.
- Compound* : A focus is compound if it comprises a basic focus and one or more isolates.
- Concomitant* : Two characteristics which divide up a subject in exactly the same way are said to be concomitant (Ranganathan).
- Connecting symbol* : A symbol in a classification term coupling two substantives (Ranganathan).
- Consistency* : The use in logical division of characteristics in a fixed sequence ; the arrangement of coordinate classes in a fixed sequence (Ranganathan).

- Coordinate classes* : Classes of the same order of division (Bliss); belonging to the same array (Ranganathan).
- Cross classification* : The formation of an array by the use of more than one characteristic.
- Decimal fraction* : A notation in which the place values of the digits remain intact when an extra digit is added at the end of the term.
- Denotation* : The sum-total of entities to which a term applies.
- Denudation* : The formation of sub-class by the addition of a differentia to the parent class (Ranganathan).
- Dependent facet* : A facet which cannot manifest itself unless a focus in the earlier facet manifests itself (Ranganathan).
- Diffuse facet* : When the subject matter of a document is diffusely spread over the classes in an array, that facet is diffused.
- Digit* : Any single symbolic mark that occurs in a class term.
- Dissection* : The formation of an array of sub-classes by division of a class (Ranganathan).
- Enumerative classification* : A classification which enumerates in its schedules all possible subjects (Ranganathan).
- Evolutionary sequence* : One of the ways of arranging classes or isolates in an array (Ranganathan).
- Exclusiveness* : The principle that it should not be possible to class a specific subject in more than one term in any array (Ranganathan).
- Exhaustive division* : Logical division as minute as possible in order to accommodate in a classification subjects of the narrowest extension, and to ensure that the terms in an array should accommodate all possible species of the parent class.
- Energy* : One of the fundamental categories of substantives (Ranganathan).
- Entity* : Any existent, concrete or conceptual.

- Facet* : The totality of the sub-classes of a Basic class derived by the use of a single train of characteristic (Ranganathan).
- Facet analysis* : The enumeration of the possible trains of characteristics by which a main class can be divided (Ranganathan).
- Facet formula* : The notational representation of the facets of a basic class and the order in which they are to be used in constructing a class-number (Ranganathan).
- Filiatory sequence* : Like Apupa pattern.
- First sectors* : The totality of sectors in which the first significant digit of an isolate number is an Arabic numeral other than 9 (Ranganathan).
- Focus* : A concerned class or isolate in the idea plane ; a concerned subject or an isolate in the verbal plane ; and a class number or isolate number referred in the notational plane (Ranganathan).
- Fundamental category* : One of the categories of substantives : time, space, energy, matter and personality (Ranganathan).
- Genus* : A class which may be differentiated into species.
- Geographical device* : The further division of a class by terms expressing place or physical features.
- Hospitality* : The quality of a notation which permits insertion of new terms and digits. Flexibility is another name.
- Hospitality in array* : The quality of a notation which permits extrapolation and interpolation in an array (Ranganathan).
- Hospitality in chain* : The quality of a notation to accommodate any number of sub-classes in its chain.
- Immediate universe* : The parent class from which a given class has been differentiated with the aid of a derived Indrugle characteristic (Ranganathan).
- Influence relation* : A relationship between the phases of different types.
- Isolate* : Generic term to denote isolate idea, isolate term or isolate number (Ranganathan).

- Isolate idea* : A unit of thought which cannot be a class or denote a subject by itself, but yields a class when attached to a basic class (Ranganathan).
- Isolate number* : A number representing an isolate idea ; it occurs in a facet (Ranganathan).
- Isolate term* : The word or words in a natural language denoting an isolate idea ; it occurs in a facet (Ranganathan).
- Lamination* : The formation of a compound focus by combination of one or more isolates with a basic class.
- Last sector* : Any array in CC, whose isolate numbers begin with a capital letter.
- Level* : In each round, there may occur more than one manifestation of a given fundamental category. Each of these manifestations is a level (Ranganathan).
- Main class* : A fairly homogeneous region of the universe of knowledge given by a scheme of classification as a focus in its first order array of the universe of knowledge.
- Mnemonic* : An aid to memory.
- Modulate* : To form a chain of classes by appropriately small steps in division.
- Multifocal* : A facet of a subject is multifocal when several, but not all, the foci in an array of it manifest themselves in the subject represented (Ranganathan).
- Notation* : An artificial language of symbols other than words of a natural language so devised that the symbols can be arranged according to their ordinal values in a unique sequence by means of conventional rules, this sequence helpfully revealing relationship between the subjects symbolised.
- Optional facet* : The use of distinctive connecting symbols indicators to introduce the various categories of facet, so that all facets are not made necessarily dependent (Ranganathan).

- Order* : The order of a class or an isolate is the number of successive characteristics used to derive it from its original universe (Ranganathan).
- Partial comprehension* : Describes a subject which includes more than one class or isolate in an array (Ranganathan).
- Penultimate sector* : Last but one sector of an array.
- Penumbral* : A heading which is partly relevant to the subject (Ranganathan).
- Personality* : A category of substantives which are unanalysable and have to be handled gently and as a whole (Ranganathan).
- Phase* : That constituent of a subject which is derived wholly from a single main class (Ranganathan).
- Posterior common isolate* : Common isolate which narrows the extension of class and does not require a connecting symbol.
- Primary phase* : In any assemblage of phases, that on which the main interest is focussed (Ranganathan).
- Round* : In a compound focus, each fundamental category may manifest more than once. Each such manifestation is a round.
- Scheduled mnemonic* : Similar meaning of numbers used in a schedule of classes or isolates which recur as subdivisions of several classes.
- Sector device* : Division of an array into sectors.
- Seminal mnemonics* : The association of each general thread of meaning of each digit in notation, i.e., 5=liquid, water, ocean, power, women, etc.
- Sequence number* : Now replaced by collection number.
- Special* : A subject of specialisation under a Basic class.
- Subdivision* : Divisions of a class.
- Subject device* : Division or formation of an isolate by borrowing the isolate number from another class to indicate temporary occurrence.

- System* : A school of thought under a Basic class.
- Telescopic array* : An array in which all isolates are not coordinate in the idea plane though apparently coordinate in the notational plane (Ranganathan).
- Terminology* : The system of terms used to denote or name the classes or isolates in a scheme of classification or in any discipline schedule (Ranganathan).
- Train of characteristics* : A succession of characteristics used in subdividing a universe so as to yield in succession wholes and not leading to organs or constituents (Ranganathan).
- Ultimate class* : The class of smallest extension and greatest intension available in scheme of classification to accommodate subject under consideration (Ranganathan).
- Umbral* : A heading which is intimately relevant to the subject sought (Ranganathan).
- Unifocal* : A recorded thought is unifocal if it is exclusively on a single class.
A subject is unifocal in a facet if it covers only one isolate in it (Ranganathan).
- Universe* : The field of knowledge which is to be classified.
- Versatility of notation.* Many sided ability of the notation.

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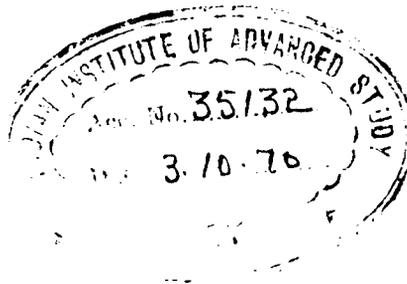
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