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ANALYTICO-SYNTHETIC CLASSIFICATION IN PERSPECTIVE.

(Development of library science. 3).

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A review article based on two recent publications on classification.* Discusses the value of the application of Scientific Method to research in classification, the helpfulness of the methodology of dividing the work of designing a scheme for classification as well as classifying as belonging to the Idea Plane, Verbal Plane, and Notational Plane, of working deeper at the near-semantic level to sense the essence of the pattern of relationship among the entities in the universe of knowledge and thus formulating postulates and principles for the different kinds and levels of work involved in the design and development of classification, and shows that such a methodology builds into a scheme for classification the ability for self-perpetuation, and consistent phased development to meet the growing complex demands of the dynamic universe of knowledge. The mode of development of the Colon Classification in the last four decades and the

*1. RANGANATHAN (S 'R). Colon classification. 1965. (Rutgers series on systems for the intellectual organisation of information. 4).

2. VICKERY (B C). Faceted classification schemes. 1966. (Rutgers series on systems for the intellectual organisation of information. 5).

organisation for its further development is considered to be consistent with and as a result of, the changing role of the library in society.

Abbreviations used :

CC = Colon Classification

Vickery = VICKERY (B C). Faceted classification scheme. 1966.

0 INTRODUCTION

01 STOCK-TAKING

In the course of its development, a school of thought in a "live" discipline finds it helpful and even necessary to look back, re-think, and re-examine its foundational ideas, and consolidate the achievements upto that moment. Such a review often enables the formulation of subsequent directions and even sets the pace of research and development in the discipline. Further, a comparative study of the different schools of thought or systems in the discipline could then be done at the near-seminal level of basic foundations rather than merely at the level of their superficial performance capabilities. Considered from this angle, the Rutgers Series on Systems for the Intellectual Organisation of Information, are noteworthy. For, the series is "intended to examine the various methods or systems individually, study them in depth within the framework of a Seminar Series, and then produce a group of papers which in addition to being state-of-art contribution to the scholarship of the field, would also serve as a basis for the ultimate objective, systems comparison."

02 COLON CLASSIFICATION

The Colon Classification was the fourth in the Rutgers Series. The Seminar was held on 19 and 20 November 1964. The subject was presented by Dr S R Ranganathan, the author of the Colon Classification. The publication presents a cross-sectional view of the past and present investigations and the probable future lines of development of the CC, and the concepts forming its basis. The Seminar also provided an opportunity for the experts in classification to recapitulate and re-examine the concepts forming the foundation of the discipline.

03 FACETED CLASSIFICATION SCHEMES

The fifth Seminar was on Faceted Classification Schemes. It was held on 1 and 2 March 1965. The subject was presented by Mr Brian C Vickery of the Manchester College of Science and Technology, Manchester, England. Mr Vickery's contribu-

tions on faceted classification are now well known. A great proportion of the exposition at the Seminar is based on the work of the Classification Research Group of England (=CRG) during the last 15 years. In a sense this Seminar supplements the one on CC which immediately preceded it. For, it represents, in some measure or other, the impact of the concepts forming the basis of CC on CRG's work of designing faceted schemes (Vickery P 10). Reports on the work of the CRG have appeared from time to time in various periodicals and as separate reports. More than any other team, the CRG has, perhaps, helped to disseminate to the Western audience some of the concepts forming the basis of CC. Vickery evaluates the concepts forming the basis of a faceted classification in general and the work of the CRG on the subject in particular.

1 LIBRARY CLASSIFICATION

11 FACTORS INFLUENCING ITS DEVELOPMENT

Library service is essentially a social service — a service to the individual members and groups in the community. Library classification is one of the techniques of the librarian designed to achieve efficient library service through the organisation of the universe of knowledge embodied in documents, in a helpful sequence. Its development will, therefore, be influenced by the mode of use of the documents by readers from time to time, and also by the level of the universe of knowledge embodied in the documents. Both these factors are, in turn, influenced by the state of the society itself. To be useful, classification must keep up with the changes in the social pressure as may be sensed from the quality of the readers and the kinds of documents to be organised for service to them. To be dynamic, it involves continuous work at several levels — at the seminal and research levels (that is, the intuitive and intellectual levels), and at the pragmatic level of classifying. The work in each of these levels must go ahead to keep step with the problems that may be posed by the influencing factors mentioned above.

By design or by accident CC has developed in a manner endowing it with sensitiveness to the changes in the concept of library service and document use. Through continuous active research it has been continuously improving upon its ability to meet the changing requirements.

2 CC'S METHODOLOGY FOR DEVELOPMENT

21 BROAD LINES OF DEVELOPMENT

The broad lines of development adopted by CC are

1 Continued investigation on the methodology for the design of a self-perpetuating scheme of classification which could meet the exacting demands of the growing complexities of the universe of knowledge and the consequent changes in the pattern of the use of documents;

2 Progressively making the design work and the development of the scheme more and more amenable to Scientific Method; and incidentally

3 Progressively making the work of the classificationist and that of the classifier more productive—that is better guided, more consistent, and fruitful in terms of time and effort.

22 SPECIFIC APPROACH

CC's specific approach may be summarized as follows:

1 Demarcation of the work involved in the design and development of classification as belonging to three planes—Idea Plane, Verbal Plane, and Notational Plane;

11 Assigning paramountcy to the work involved in the Idea Plane;

(*Annotation.*—This has facilitated the progress of work in each of the planes without any of them being constrained or confused by the difficulties that may arise in any of the other planes.)

2 Bypassing the confusing picture presented at the phenomenal level by the innumerable inter-relations among the bits of knowledge constituting the universe of knowledge;

21 Making this possible by diving deeper to the near-seminal level and sensing the essential character of the bits of knowledge and also the essence of the bonds among them;

3 As a corollary to 2, not getting involved in too many details, when such details can be dealt with more conveniently at the later stages in the work;

4 Therefore, assigning priority for consideration and solution to the different problems that may come up simultaneously;

5 Enunciation of postulates or guiding principles for each area of work;

(*Annotation.*—This is a help in setting up models of schemes on the basis of experience and observation. Further developments are facilitated and adjustment or replacement of the model and of the postulates on which it is based, is made possible, as and when warranted by further experience and observation. In addition, the postulational approach helps to avoid wasteful discussion on issues for which an unequivocal decision is impossible in a given context of knowledge about the issue concerned);

6 Progressively reducing the number of situations making

us depend on flair and subjectivity, and formulating guiding principles for objectively and systematically meeting such situations; and

Reducing the strain on the memory of the classificationist and the classifier, and even of the reader, with the aid of mnemonics of several kinds.

23 WHY OF SCIENTIFIC METHOD

The original design of CC was largely a result of intuitive approach. But making the design work progressively more and more amenable to scientific method, has made co-operative team research in the field possible. Further, it has enabled placing greater reliability in the basic ideas of the scheme.

In the process of gathering experience, there is perhaps an innate tendency in man to hasten. More often than not he is satisfied with what he experiences or observes at the phenomenal level, or he is bewildered by his experiences. All too often, one does not stop to dive deeper to examine the foundations which support and lend shape and stability to the superstructure. This may not create any serious difficulties in the routine everyday situations due to the concreteness of the context. But, in laying the foundations of a discipline and in developing it, such investigations at the seminal and near-seminal levels is the only guarantee of the firmness of the foundations. To ensure a systematic investigation it is usual to adopt a procedure generally named the Scientific Method. The method offers a critical and systematic process of investigation and reasoning in the study of a subject or a phenomenon. It generally leads to publicly verifiable conclusions. The goal is to discover what the facts truly are without their being vitiated by personal hopes and prejudices. Scientific Method questions at every stage, whatever lacks evidence. Sifting the evidence and deriving inference from it must conform to the relevant canons of logic. Intensity of belief or mere psychological certitude does not guarantee truth. Therefore, Scientific Method provides a means of self-correction for a discipline at each stage of its development. A system that is amenable to cultivation on the basis of such a methodology acquires something of a universality, reliability, and self-perpetuating quality. As Vickery puts it (P 26): "... at the very least it (facet analysis) has the virtue of being an explicit technique that can be described, communicated, taught, analysed, criticised, amended, and improved. It is not left to uncommunicable and inconsistent intuition. This is the chief reason why the technique merits attention."

The methodology for the development of CC is a fine illustration of the application of the Scientific Method to research

and development in classification.

3 HELPFULNESS OF CC'S METHODOLOGY

The helpfulness of some of the specific approaches of CC (See Sec 22) to invest classificatory technique with the ability to meet the exacting demands of document retrieval, and at the same time to make the design and development of classification schemes more and more productive, are briefly discussed in the succeeding sections.

30 HELPFULNESS OF NORMATIVE PRINCIPLES

CC recognises the following hierarchy of normative or guiding principles, named differently for the purpose of distinction:

1 General Basic Laws, such as the Law of Symmetry, the Law of Impartiality, the Law of Parsimony, the Laws of Interpretation, the Law of Parameter, and the Principle of Local Variation;

2 Laws of Library Science;

3 Postulates for Classification;

4 Principles for Facet Sequence;

5 Canons for Classification; and

6 Principles for Isolate Sequence.

31 EXAMPLE 1: LAWS OF LIBRARY SCIENCE

The Five Laws of Library Science, first formulated in 1929, have largely guided the research in and the development of, CC.

311 First Law—Books Are For Use

The 'use of a document' by a reader may be taken to be equivalent to the 'use of the subject treated or thought embodied' in the document. Therefore, to satisfy the First Law, the arrangement of the documents and the main entries for them should be on the basis of the thought embodied in them.

312 Second Law—Every Reader His Book

Conforming to what is implied by the First Law, the Second Law ensures bringing together pinpointedly just those documents that are relevant to the interest of a reader at the moment. As a result, the chances of retrieval of irrelevant documents is reduced to a minimum. Such an arrangement has been named 'Apupa Pattern'. An Everywhere-Apupa-Pattern would be the ideal arrangement to meet the requirement of all readers at all times. This would be possible if in the transformation of

the multidimensional universe of knowledge embodied in documents into a one-dimensional linear arrangement every Immediate-Neighbourhood Relation among all the subjects of the universe, be kept invariant. This appears to be impossible with the available techniques of classification. Therefore, a particular pattern of arrangement is chosen so as to suit the needs of the majority of the readers. What this pattern is, is largely a matter of conjecture by the designer of the scheme for classification. This has resulted in different models of arrangement depending on the pattern adopted. A firm, reliable basis for fixing any one pattern requires extensive statistical investigation. For the time being, the minority approaches are sought to be satisfied by the other library tools and services — *viz* library catalogue, good reference service, and managerial methods.

313 Third Law — Every Book Its Reader

This implies that at the time of document retrieval, no document relevant to the purpose of the reader's interest at the moment should be missed. The inadequacies of transformation mentioned in the preceding section are impediments to achieving an arrangement that would fully satisfy the Third Law. Supplementary help is provided through the catalogue and administrative methods.

314 Fourth Law — Save the Time of the Reader

To conserve the reader's — particularly the specialist reader's—mental and intellectual potential, he should be enabled to locate on the shelves or in the catalogue just those documents or the entries for them, as the case may be, that would satisfy his requirements at the moment. This is an implication of the fact that the reader's time—objective and subjective—should not be allowed to waste in the mere process of searching for the documents or the entries for them. This demands in the classification scheme the capacity to provide co-extensive class numbers for macro as well as micro thought.

315 Fifth Law — Library is a Growing Organism

A more generic version or a pre-form of this law will be 'the universe of knowledge is ever-growing'. The term 'ever-growing' implies several characteristics of the growth of the universe of knowledge. It implies that through its cultivation at several points, new bits of knowledge are being added to knowledge already known. It also implies that there is no let in the process of growth. The development keeps on. This makes the universe of knowledge 'infinite'. Uncultivated areas and the fallow regions of the universe of knowledge get filled up making

it tend towards being a 'continuum'. It also implies that a new bit may come up at any moment. Further, the extension of the new bit may be that of a tiny isolate or it may be as large as that of a Basic Class. The present state of the growth of the universe of knowledge is, therefore, conjectured to be manifold multi-dimensional, infinite, turbulently dynamic, and continuum.

32 IMPACT ON DESIGN OF CLASSIFICATION

These qualities of the universe of knowledge demand in a scheme for classification the capacity to accommodate any kind of new bit of knowledge. Further, it should be able to accommodate the new bit in the appropriate filial sequence, without entailing considerable disturbance in the existing linear arrangement of the entities in it. The turbulently dynamic character of the universe of knowledge makes it possible to conjecture the developments in it only to a limited extent. This implies that we cannot have a once-for-all programme for the classification of knowledge. Only a phased programme is practicable. The classificationist can design the scheme for the successive state of the universe of knowledge as and when such states become discernible. To ensure consistent development, a master plan or a model such as the General Facet Formula may be provided. More important it is to invest the scheme with the ability for phased development according to needs.

321 Guided Analytico-Synthetic Scheme

An analytico-synthetic scheme for classification—that is, a classification based on explicitly stated principles and postulates, and involving the analysis of the subject into its facets in the idea plane, transformation in the verbal plane, translation from the focal terms in the verbal plane to the focal numbers in the notational plane, and synthesis of the focal numbers into class numbers in the notational plane—has been demonstrated to have better capabilities than other models of conventional methodology, such as an enumerative model. Among other things, this capability of an analytico-synthetic scheme arises from the fact that it presumes, in the idea plane, the possibility of an infinity of characteristics being added one after another in an infinity of facets to be added one after another in the classification of the universe of knowledge. This is necessary if the classification is to handle the manifold multidimensional quality of the universe of knowledge. In fact, the essence of the difference between schemes for classification should be looked for here. Alan Rees (Vickery P 14) comments: "In very brief summary we might say that faceted schemes are analytico-synthetic rather than enumerative." In his paper to the Elsinore Conference [8] and in the Rutgers

Seminar on Colon Classification, Dr Ranganathan has clearly brought out the differentia between a mere faceted scheme and an analytico-synthetic scheme. In its four decades of development, the CC has been continuously attempting to make a closer approximation to the guided analytico-synthetic model.

Vickery discusses in some detail (page 16 ff and Chap VI) the merits and the demerits of special faceted schemes — that is, schemes for narrow specific subjects — in relation to general (universal) classification schemes such as the UDC. The development of depth schedules for specific narrow subjects and of universal schemes are not incompatible. In fact, the analytico-synthetic methodology based on explicitly stated guiding postulates and principles — as opposed to a mere faceted scheme — provides a design methodology by which a universal scheme can be developed as a whole, and any one particular area in the universe of knowledge covered by it may be provided with special depth classificatoin schedules consistent with the postulates and principles for the universal scheme as a whole [8].

322 Modes of Formation of Classes

While there is uncertainty about the direction of development of the universe of knowledge, some guiding ideas have been formulated in regard to its mode of development, and the formation of classes. Dissection, dismembering, denudation, lamination, and loose assemblage, are, for the time being, deemed to be the modes of formation of classes. For each of the modes, a particular kind of relation may arise among the entities concerned [4]. The CC notational system has developed tactics to meet the results of such developments. There are devices for Hospitality in Array, devices for Hospitality in Chain, Hospitality amidst Quasi Isolates, and Hospitality in Facets.

323 Bond Strength

The structure of the Colon language expresses the particular kind of relation recognised among the constituent isolates of the class number. The CC class number does not merely denote a distinctive facet in it to represent the constituent kernal idea and nearly all the characteristics used in deriving the isolate idea in each of the facets, but it denotes also the strength of the bond between the constituents of the class. A careful study of the structure of the class number has led to the formulation of the Bond Theory of Class Structure. Seven kinds of bonds were enunciated for the first time at the Rutgers Seminar (Chap V).

4 EXAMPLE 2 — CONTROVERSY ABOUT BASIC CLASSES

In the design of a scheme for classification and also in document search and retrieval, it is a convenience if the universe of knowledge is broken down into a few regions of knowledge in the first instance. The regions may be called Main Classes. Like the sensory faculties, the intellectual faculty of man also feels comfortable to work in a restricted range. It finds it inconvenient to handle the universe of knowledge as a whole; it is also incapable of feeling its way comfortably among the innumerable isolates at the phenomenal level. Therefore, in classification a breaking down of the universe of knowledge into convenient bits on the one side and the grouping of the isolates into larger aggregates on the other side, is a convenient way of dealing with it. One of Vickery's criticism of the General Electric's Faceted Classification Scheme for Engineering is: "It was a mistake entirely to disregard the traditional academic subdivisions in favour of the 'Fundamental Categories'. This abandoning of the traditional classes has created many problems" (Vickery P 100).

There appears to be still a confusion about the idea of 'Fundamental Categories' as conceived in the theory forming the basis of CC and what are named as categories, facets, etc in other schemes of classification. In two earlier papers [2, 3] attempts have been made to clarify the concepts.

The Main Classes may be determined on the basis of the current practice in the learned world. For convenience again the Main Classes have to be arranged in a helpful sequence. The number of such sequences may be quite large. Among ten Main Classes there can be Factorial ten ways of arranging them. A classificationist has to prefer some one sequence.

With the development of the universe of knowledge, the number of main classes recognised in one age may prove insufficient in a later age. A new Main Class is usually grouped under the respective old Main Class according to the filiation recognised. In this traditional subgrouping the new Main Class is called a Canonical Class. The generic term 'Basic Class' may be used to denote either a Main Class or a Canonical Class. With the accelerated growth of knowledge the frequency of additions to the list of Basic Classes also increases. Therefore, there is now considerable fluidity regarding the concept of Basic Class. Some principles for deriving Basic Classes are now being examined by the members of the DRTC in Bangalore. However, neither can we freeze the number of Basic Classes nor can the design of classification and document retrieval wait until these questions are settled.

41 HELPFULNESS OF POSTULATIONAL APPROACH

In these circumstances, CC has postulated a list of Basic Classes necessary and sufficient in the light of the literary warrant at the moment. Further, it has provided the necessary device such as the Empty Digit Device, Emptying Digit Device, and Emptying and Empty Digit Device, to accommodate any new Basic Class in the appropriate place in the filiation sequence [19]. This approach is helpful in that it is prepared to accommodate any new Basic Class whenever warranted, and conserves the intellect from being wasted on questions such as how many Basic Classes there should be, what should be their sequence, etc. For, at no time there can be an unequivocal answer to these questions.

5 EXAMPLE 3 — BUILDING CLASS NUMBER**51 NO READY-MADE CLASS NUMBER**

In general, CC does not attempt to fix the sequence of the subjects going with a Basic Class. On the other hand, it works at the near-seminal level guided by certain postulates. It will be remembered that a guiding principle is provided by the intuition. There is no question of it being 'right' or 'wrong'. The consideration should be whether or not it is useful in further work in the subject. In scientific methodology an unhelpful principle would get replaced by a helpful one.

52 HELP FROM POSTULATES

In the construction of a Class Number, the postulates help to analyse the subject into the constituent kernel ideas, determine a helpful sequence among them, and to synthesise them such that the combination is co-extensive with the thought content of the document. Such a procedure helps to achieve a consistent sequence in the arrangement of all the classes going with a specific Basic Class; further, the sequences among the subjects going with the various Basic Classes conform to a recognisable single pattern consistent with the master model. The postulational method has been found helpful both in the design of schemes for classification in document search and retrieval. Some of the principles guiding CC's development are enumerated in the succeeding sections.

53 POSTULATES FOR IDEA PLANE

The following postulates have been formulated for Idea Plane:

- 1 Postulate of Fundamental Categories
- 2 Postulate of Basic Facet

- 3 Postulate of Isolate Facet
- 4 Consolidated Postulate about Subject
- 5 Postulate of Round for Energy
- 6 Postulate of Round for Personality and Matter
- 7 Postulate of Level for Personality
- 8 Postulate of Level for Matter
- 9 Postulate of Level for Space
- 10 Postulate of Level for Time
- 11 Postulate of Concreteness
- 12 Postulate of Sequence
- 13 Postulate for Space and Time Facets
- 14 Postulate of Level Cluster

54 PRINCIPLES FOR FACET SEQUENCE

After the kernal ideas of the facets of a subject have been determined, they are to be arranged in a helpful sequence. Five guiding principles have been formulated for this purpose. These are:

- 1 Wall-Picture Principle
- 2 Commodity-Raw Material-Transformation Principle
- 3 Actand-Action-Actor-Tool Principle
- 4 Whole-Organ Principle
- 5 Cow-Calf Principle.

Among the Principles for Helpful Sequence, the Wall-Picture Principle is a basic one. The others may be considered particular forms of it. Although the Wall-Picture Principle was specifically formulated to derive a helpful sequence among facets, it has been found helpful in determining a helpful sequence among Array Isolates, Quasi Isolates, and Groups of Quasi Isolates. It has been noted that the sequence got by its application parallels the sequence derived by the postulate of sequence among Fundamental Categories (Paper in preparation). This is a measure of the near-seminal nature of the Wall-Picture Principle. However, the other principles such as the ones for Array Isolate Sequence [21] are available for convenient ready application.

On the CRG's approach, Vickery comments (P 54): "Instead of a universal Facet Formula (P-M-E-S-T), the CRG school has developed a series of citation chains for more specifically named facets. Thus,

- I Entity-Part-Constituent;
- II Entity-Property-Measure;
- III Entity-Process;
- IV Entity-Operation-Agent.

"An arrangement of facets is sought that will provide a schedule order that can in most cases be used automatically as a combination order" (Vickery P 56). The Principles for Helpful Sequence

have been formulated to achieve just this. The minority-approach is met with the aid of the catalogue and other administrative methods.

The 'Combination order secured by the 'citation chains mentioned above appear to be all taken care of by one or the other of the Principles for Helpful Sequence. For example,

I Is equivalent to the Whole-Organ Principle;

II Is equivalent to [P] [M] [E] sequence; this is also in conformity with the Wall-Picture Principle;

III Is equivalent to [P] [E] sequence;

IV Conforms to Actand-Action-Actor Principle, which is also a derivative of the Wall-Picture Principle.

55 DEVICES

In order to ensure that the structure of the class number not merely conforms to the analytico-synthetic model, but that the Canon of Consistent Sequence is more or less automatically conformed to, certain devices have been formulated for the formation of isolates. These are

- 1 Enumeration device
- 2 Chronological device
- 3 Geographical device
- 4 Subject device
- 5 Quasi-Subject Isolate device
- 6 Superimposition device
- 7 Mnemonic device.

56 GENERALITY OF THE POSTULATES AND PRINCIPLES FOR THE IDEA PLANE

In relation to the design of a classification scheme, the delineation of the structure of the universe of knowledge, sensing its mode of development, recognising the kinds of relations among the items of knowledge, and postulation about the pattern and the relations recognised—all these belong to work in the idea plane. Every modern scheme of library classification aims to organise in a helpful way the universe of knowledge embodied in documents. Therefore, they have necessarily to deal with the attributes of the universe of knowledge mentioned above. In other words, the work in the idea plane is common to all schemes of classification. Thus, the postulates and principles for the idea plane developed by the Indian School of Thought are not necessarily for the design and development of CC alone. They should be equally helpful in the development of other schemes also.

This is, perhaps, implied in Vickery's statement: "I believe that all retrieval systems using a file of index words can be

improved by the use of a structured vocabulary. Facet analysis offers a technique of vocabulary construction, and I believe it to be a good one." (P 26). Upto the fifth step in the Postulational Approach are applicable to the analysis of concepts without specific reference to any scheme of classification. From this step, one could proceed either to synthesise the class number on the basis of a scheme for classification or to use the kernel terms in the transformed title for deriving Subject Headings and Feature Headings.

6 NOTATIONAL PLANE

61 FUNCTION

The essential function of the notational plane is to faithfully implement the findings of the idea plane. In library classification it is common practice to denote classes by class numbers and documents by call numbers. The call numbers mechanise the arrangement of documents and their main entries in the catalogue or documentation list. The predetermined helpful sequence of classes can be maintained with a minimum of effort and cost even if the sequence is disturbed. The Law of Parsimony is thus satisfied. The totality of class numbers may be deemed to constitute the Classificatory Language of the scheme. Schemes for classification may differ in the classificatory language they use.

62 GRAMMAR OF THE NOTATIONAL LANGUAGE

Again, working at the near-seminal level, certain general requirements for the notational system have been formulated by CC to create a 'grammar of the classificatory language'. This consists of two principal phases of work:

1 Canons for the Notational Plane applicable to any classificatory language; and

2 Specific rules for the classificatory language of CC.

The latter phase consists of

1 Working out the semantics of the digits used; and

2 Grouping the digits to satisfy the Canons for the Notational Plane.

63 CONTRIBUTIONS OF CC

The principal contributions of CC to ideas on the notational system are:

1 Generalisation of the concept of ordinal numbers;

2 Use of mixed notation;

3 Setting apart, normally, the last digit of each species of digits as a sectorising digit (sector notation);

- 4 Concept of telescoped array;
- 5 Concept of telescoped facet;
- 6 Packet notation;
- 7 Concept of Emptying Digit, and Emptying and Empty Digit for interpolation of array isolates; and
- 8 Introduction of a schedule of phase relations between classes, between isolates within one and the same facet, and array isolates respectively.

In the last three years, with the progress in the design of depth schedules for subjects going with different Basic Classes (over a hundred) the capabilities of the notational system of CC are being recognised in an increasing measure. Experience is also being gained in the economic utilisation of the notational system [9, 10].

7 VERBAL PLANE

71 NAMING OF ENTITIES

If the work in the idea plane is to be of practical use in the organisation of knowledge embodied in documents, the verbal plane and the notational plane (See Sec 6) should be brought into the picture. The verbal plane is concerned with words and terms in the natural language. To begin with, the items of knowledge in the schedule have to be named. Secondly, readers cannot name the subjects in the classificatory language. They use the natural language. Therefore, an alphabetical index to the class numbers becomes necessary. A reader generally names a subject of greater intention than what he may have in mind. The alphabetical index leads him to the classified part wherein the entries are arranged in filiation sequence with suitable feature headings to facilitate the easy location of the entries—or just those documents of interest to him at the moment.

72 MULTIWORDED HEADINGS

The names of most of the classes are multiworded, particularly so in the case of micro thoughts. The multiworded names have to be expressed in Multiple Headings. The latter constitute an artificial language with its own syntax, although the words in it are taken from the natural language. There arises the problem of sequence of the terms in a Multiple Heading. The Chain Procedure more or less mechanises and makes the choice, rendering, and sequence of the terms consistent. In recent experiments for testing the efficiency of different kinds of classification, a considerable improvement—taking it to the first rank—has been shown to be possible by supplementing a faceted classification with a well-designed set of index terms to provide

for the approach of the readers *via* the terms for the concepts (Vickery P 86). In the provision of entries with the terms in a heading permuted an important consideration is to ensure that the permutation does not yield a subject different from the one sought for.

73 HOMONYM

After the Canon of Currency, the Canon of Context, and the Canon of Enumeration were formulated thirty years ago it is only during the last two or three years that the verbal plane is being examined in some detail once again. The extensive application of the Chain Procedure to derive Feature Headings and Class Index Headings from depth class numbers for microthought, has brought to light several newer problems particularly in respect of homonyms [7].

74 SYNONYM

Synonyms create further problems. The question of including in the schedule and/or the index, the alternate terms in current use has to be examined further. The provision of a thesaurus or a similar list of terms used in the retrieval system is another point for consideration. In regard to the terms to be used in the schedule itself, the standard glossaries of technical terms in the different disciplines are of considerable help to the classificationist.

75 COMPOSITE TERM

The advantages and disadvantages of the use of constituent isolate terms instead of a composite isolate term, the problems of the economy or otherwise *vis-a-vis* the requirements of the reader in respect of permutation and combination or cyclic permutation alone, of the isolate terms in a Multiple Heading, or of conforming to the existing rules of the Chain Procedure, need objective testing in actual practice in libraries, and with documentation lists.

These and related problems were discussed at both the Seminars. An important consideration is that the work in the idea plane should proceed avoiding the aberrations that may be caused by the faults in the verbal plane. Calvin Mooers commented at the Seminar on Faceted Classification as follows: "In the description of faceted classification, the emphasis is upon verbal words, terms; and this is in contrast to the approach epitomized by J C Gardin in which the emphasis, at least the emphasis that Gardin tries to make, is upon concepts. In other words, Gardin approaches the matter of classification by looking for the idea first and then looking for the symbol which might be

used to clothe it. In constructing a faceted scheme, as has been repeatedly mentioned in one form or another, you collect terminology from dictionaries, thesauri, and then try to organize a terminology. You collect words. You use terms. As I see it, only as an after-the-fact matter do you come around to the fact that these words epitomize conceptual entities. There are confusions inherent in basing your work at the terminological level rather than trying to truly go to the conceptual level."

It is difficult to separate a concept from the name for it. Mooers' comment is typical of those cases where the 'confusion' may have been avoided if the work of classification is demarcated into that involved in the Idea Plane, Verbal Plane, and Notational Plane respectively as is being done in Indian School of Thought. Further, an agreed standard terminology in classification would have been a great help [1, 5]. The terminology such as isolate, isolate idea, isolate term, isolate number, could help to delineate the concepts involved in this case.

8 SOCIOLOGY OF CC

In the succeeding sections some of the social forces, which have perhaps influenced the development of CC, are summarized.

80 PERIODS OF DEVELOPMENT

The 40-year period of development (1925-1965) of CC covered in the seminar volume can be conveniently divided into the following sub-periods for the purpose of our discussion:

- 1 1925-32 Pre-natal Period
- 2 1933-47 Formative Period
- 3 1948-57 Development Period
- 4 1958-62 Try-out Period
- 5 1963- Team-work Period

81 PRE-NATAL PERIOD (1925-32)

The work of the design in CC during this period appears to have been largely characterised by intuitive approach. It was largely based on Dr Ranganathan's flair and intuition; for, there was then no appreciable precedence in library classification for starting work with facet analysis. The sequence thus secured was subjected to pragmatic test. This consisted of classifying the books in the Madras University Library by the tentative draft of CC, and watching the reaction of readers to the arrangement brought about by the scheme. Discussions with his colleagues in the library and with some of the subject specialists may have also helped. Sayer's Canons and his own Laws of

Library Science then being formulated — first in his own mind and then explicitly — should have been the other guiding lines. Comparison of the results of the classification of the documents with the results obtained by Decimal Classification provided further helpful lines of procedure.

82 FORMATIVE PERIOD (1933-47)

Much of the effort during this period was directed towards a study and discovery of some of the potentialities of CC's new approach to classification. However, the test was largely confined to macro documents. This may be traced to the social context then prevailing.

820 Social Context

During this period the concept of productivity was at best in an incipient stage. Team research and relay research, which call for efficient utilisation of published information — published upto the moment and particularly those published as articles in periodicals — had not caught the thinking of the society. In the public library and in the academic library, the sources of information were largely books. In the industry and in the research laboratory, the book was being slowly supplanted by micro documents — articles in periodicals, reports, etc — as carriers of nascent thought for the specialist. But the then available tools of the librarian were inadequate to organise the micro documents to facilitate efficient retrieval. The specialist himself therefore tried to do both research in the laboratory and document search in the library.

821 Edition I of CC

It was in this context that edition I of the CC was published in 1933. In the new approach of CC to classification, ready-made class numbers were not given. But they were to be constructed by the combination of appropriate isolate numbers from a set of schedules given for each subject, according to a prescribed facet formula. This rigid prescription automatically secured consistent sequence among facets of the class numbers of all the subjects going with a given Basic Class. However, the fixing of the sequence of facets in the facet formula appeared to have been largely a matter of flair — in other words, it did not have a deep root.

822 Edition I of "Prolegomena"

The *Prolegomena to library classification* was published in 1937. The schedules of CC were tested against the twenty-eight canons in this book on the theory of classification.

Experience in reference service to specialists using the Madras University Library indicated change of sequence of facets in certain subjects. From this time onwards, the design and development of CC and the examination of the concepts on which it was to be based, proceeded more or less simultaneously.

83 DEVELOPMENT PERIOD (1948-57)

830 Social Context

The period, following the Second World War and the gaining of independence by India, was characterised by a new kind of awareness in society. In many countries of the world in general and in India in particular, attention was focussed on plans for self-sufficiency in regard to the essentials of the daily life of the citizen. Economic awareness led to the successive Five-Year Plans and the development of applied research and industries of all kinds to make productive use of the material and human resources. Scientific management became the need of the hour in all spheres of activities. Solo research and parallel research gave place respectively to team research and relay research. The need for effective use of cumulated information, and the concept of division of labour between the specialist on the one hand (research worker, production engineer, and the manager) and the librarian on the other, in the interest of national and international economy, came to be more clearly sensed. This change in the social context posed a challenge to the librarian to sharpen his tool to effect pinpointed, exhaustive, and expeditious documentation service in order to meet the situation. CC took up the challenge. The Development Period marks the beginning and progress of vigorous co-operative research in classification. The experience gained during the Formative Period helped to direct the efforts to the development of the capabilities of the CC to meet the challenge of a multi-dimensional dynamic universe of knowledge. Some of the results were as follows:

831 Concept of Fundamental Categories

The classification of micro documents indicated the occurrence of several facets in many subjects. Basing on their the fixing of the sequence of the facets in the facet formula for each Basic Class became inexpeditions. Consistent sequence of facets was secured not merely among the subjects going with a particular Basic Class; but a subtler consistence was also needed among all subjects whatever be their respective Basic Classes. This consistency was found to be difficult to achieve in the phenomenal level. The need for discerning the relationship among the facets was felt. A near-seminal level approach became necessary.

This led to the possibility of looking upon each facet other than the basic facet of any subject as a manifestation of one or the other of the five Fundamental Categories—Personality, Matter, Energy, Space, and Time. Some principles for deriving a helpful sequence were also formulated [13, 16].

832 Three Planes of Work

It was during the early part of this period that the division of the work involved in the design of classification as belonging to three planes—Idea Plane, Verbal Plane, and Notational Plane—was consciously sensed. Further, the modes of formation of classes in the universe of knowledge were conjectured [11].

833 Round and Level

The concept of Optional Facet as a step in breaking through the rigidity of the Facet Formula was also the outcome of the research during this period. The concept of Rounds among Facets of a subject, the fixing up of the sequence of Personality, Matter, and Energy in each Round, the fixing of the sequence between Space and Time in the last Round, and the concept of Levels of the Fundamental Categories in a Round, were the other important contributions [14, 15]. These and other research results of this period were incorporated in Ed 2 of the *Prolegomena* (1957).

84 TRY-OUT PERIOD (1958-62)

841 Beginnings of Depth Classification

Even during the Development Period a few tentative schedules for depth classification schemes were attempted, in response to demands for them from the industries. A few more such schedules were worked out during the Try-Out Period. The development of specialist libraries and of documentation centres such as the Insdoc, from about 1950 onwards brought about an intensive demand for documentation service and for documentalists. The basing of classification on a set of postulates had been conceived even in 1956. Between 1956 and 1958 the Postulational Approach was developed and taught in various library schools, and they were subsequently incorporated in the *Elements of library classification* Ed 3 (1962). One noteworthy contribution of this Approach is that it clarified the idea that facets belong to the subjects and not to Basic Class. A Basic Class has only one facet—*viz* itself—and no other facet.

85 TEAM-WORK PERIOD (1963-)

The social ferment that has been developing during the post-independent era induced our planners to think in terms of enhancing the development of advanced level training and research in library science. The establishment of centres for advanced teaching in library science and documentation and the consequent facility for co-ordinated team work led to a break-through in fundamental research in classification. For the first time, a methodology for design of depth schedules guided by postulates and principles was hit upon. This happened in November 1963. The main features of this break-through may be summarized as follows [12]:

The method of allowing several Trains of Characteristics each based on its own First Characteristic—that is, Quasi Isolate—, in [IP1] of the subjects going with a Basic Class, occurs in the social sciences as well as in the natural sciences and their applications. In the earlier years, the occurrence of several Trains of Characteristics led to the inhibition of the idea plane from recognising that a combination of isolates drawn from two or more such Trains of Characteristics still belonged to [IP1] only. Consequently, the isolates drawn from the different Trains of Characteristics were treated as if they belonged to different levels of the Personality Facet in spite of their combination still yielding only Whole Entities of the universe concerned. In other words, Whole Entities and Non-Whole Entities were not distinguished in the Notational Plane. In the course of a class in November 1963 it was realised that the different trains of characteristics, though apparently different, together constituted only a complex Train of Characteristics yielding only Whole Isolates. Once this was recognised, the concept of Superimposition gave a convenient method for combining the isolates drawn from different Train of Characteristics into a single Superimposed Isolate in [IP1].

Since then it has been possible to apply successfully the new design methodology for a fairly large number of subjects—particularly in the field of Engineering, an area where CC schedules were meagre in the earlier years. The demand for schedules for these subjects is comparatively greater at present. The teaching of classification at an advanced level and particularly of design methodology, and the co-operative work of constructing a number of depth schedules in the last two or three years helped in the formulation of new principles and the refining of some of the earlier principles for guiding the design work.

86 FUTURE

861 Schedule Building

The potentiality of the new design methodology has

been demonstrated by the construction of depth schedules for a large number of subjects, particularly those falling in the field of Engineering. The demonstration is being continued with more complicated subjects. The design of schedules for the diverse subjects can hereafter be left largely to the library personnel at service points in the different industries and laboratories. They will have better knowledge of the respective subject fields associated with their institutions, better knowledge of the requirements of subject specialists, better facilities for consulting the subject specialist, and for testing the efficiency of the schedules in their day-to-day work. One or two national centres for research in classification may co-ordinate such decentralised design work. Any new principle or methodology arising in the design and development work by a specialist librarian can be made available to the others through those national centres. Problems for fundamental research, including those referred from the specialist libraries, can be taken up by the centres for investigation. To provide an annual personal discussion and a clearing house for all the experiences gained by the specialist librarians, the Documentation Research and Training Centre holds an Annual Seminar in Bangalore.

In Ed 2 of the *Prolegomena* and at the FID Warsaw Congress (1959) some problems for pursuit were enumerated. A few of them have since been examined. The exhaustive schedules for the various kinds of common isolates have yet to be completed. Work on the schedule of Basic Classes is under way. The application of the new design methodology to subjects in Technology and Social Sciences is being done. There is considerable scope for large-scale co-operative developmental work in the building and testing of schedules.

862 Encouraging Trend

Elsewhere [6] mention has been made of the encouraging trends of, and the organisation for, research in classification in India.

The discussions at the Rutgers Colon Seminar indicate a lively interest of the audience from the other countries in the subject. This has helped clarification of some important concepts—for example, the difference between an analytic-synthetic scheme and a faceted scheme, Basic Class formation, Postulational method, Chain Procedure, and the Principle of Osmosis.

The growing emphasis on classification as a discipline is well brought out by Dr Shera's comments at the Rutgers Colon Seminar (Sec ZQ). Mr Miles A Libbey is very right when he says (Sec ZT) that Classification is not the private preserve of librarians, but that a study of it helps to develop tools for handling

'organised complexities'. On the practical side, the other uses of an analytico-synthetic scheme are its help in the facet analysis of the reader's mind which, in turn, increases the efficiency of document retrieval, in building up a balanced book collection, in making classifying systematic and expeditious through the use of Postulational Approach, in the organisation of other sources of information such as files of correspondence, drawings, photographs, standards, patents, and even commodities themselves, and in developing a bridge language for international communication [18]. Vickery too comments on the various uses of facets analysis (Vickery P 11 ff).

Answering a question as to what needs to be done with respect to research and development in Colon Classification, Dr Ranganathan outlined three lines of research to improve classification in general and CC in particular:

- 1 Developmental research;
- 2 Fundamental research; and
- 3 Systematic testing.

Developmental research would largely consist of the construction of depth schedules, on the basis of the fundamental research already done, for an estimated 5000 Basic Classes in Engineering and Technology and related subjects. This is an area for national and international co-operation.

Several problems arising in developmental research may call for fundamental research—free undirected fundamental research provided with adequate support and facilities.

The schedules should be extensively tested and evaluated under proper conditions in the appropriate industrial and research libraries. The testing methods developed in sociology and statistical methods should be made use of.

To disseminate correct ideas about the scheme, the steps to be taken are

- 1 Teaching the fundamentals of the subject in graduate library schools, adopting the correct teaching methodology;
- 2 Training in the use of the scheme through practical and tutorial discussion in graduate library schools; and
- 3 Periodical seminars for exchange of ideas about the scheme among the practitioners and the scholars served with the scheme.

The two Rutgers publications are valuable additions to the literature on Classification in general and faceted schemes in particular. It is gratifying that the Asia Publishing House is bringing out an Indian edition of the Rutgers publication on CC to ensure its wider availability.

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