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RESEARCH IN LIBRARY CLASSIFICATION.

(Development of library science. 8). (Classification problems. 25).

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An essential basis for research in library classification is the study of the structure and development of the universe of subjects. A classification based on a resilient design methodology, and a holistic approach would ensure a good foundation for the document retrieval system. The Indian System of Thought in Classification has taken the five Laws of Library Science as the basic guiding principles, deduced canons and principles for classification, enunciated helpful postulates, and demonstrated classification work as belonging to three planes. It has attempted to grasp the essence of the relation among the constituents of the universe of subjects at the near-seminal level, progressively applied objective scientific method to classification, and developed a precise terminology for the subject. The advantages of the above lines of approach are illustrated and the kind of research involved in the different developments are mentioned. A set of problems for pursuit is given.

ABBREVIATIONS USED

[P] = Personality Facet	DC = Decimal classification
[1P1] = [P] Round 1, Level 1	[M] = Matter Facet
CC = Colon classification	

0 INTRODUCTION

01 DEVELOPING DISCIPLINE

In his Presidential Address to the Elsinore Conference (1964) (41), Dr Ranganathan traced the developments in library classification since 1876 and suggested the lines of development for the

period 1965-75. The particular mode of development of classification in each of the five periods into which the century 1876-1975 was divided, was attributed to the particular values of the two primary parameters that affect library service— social pressure and document pressure or alternatively “pressure from the universe of readers” and “pressure from the universe of subjects” respectively. Classification is not an end in itself; it is only a means to an end— namely, efficient library service. Thus, a proposition implied in the Elsinore address is that library classification should respond to and resonate with the changes in the value of the two parameters mentioned. Then alone will it continue to be a developing discipline and a useful tool in providing a library service to the satisfaction of the Laws of Library Science.

02 SCOPE OF THE PAPER

In this paper, research in library classification is considered in two broad divisions: Basis for research, and developments in research in the Indian system of thought in classification.

021 BASIS FOR RESEARCH

The study of the structure and development of the universe of subjects is first shown to be an essential basis for research in classification. In Paper Q in this issue it is shown that such a study of the universe of subjects is a necessary implication of the Laws of Library Science. In Sec 01 of this Paper, it has been mentioned that the changes in the universe of subjects affect the evolution of classification. Therefore, the implications to classification of the findings of the study of the universe of subjects are considered first as the basis for research in classification.

022 INDIAN SYSTEM OF THOUGHT IN CLASSIFICATION

The Indian System of Thought in Classification is, perhaps, more elaborate than any other system developed till now. It has been developed through *a priori* research based on the Five Laws of Library Science and through pragmatic research based on observation on the floor of libraries. This system being of Indian origin and CC also being of Indian origin, has led to the latter to conform to the findings of the Indian System of Thought in Classification more than any other scheme for classification. As a result CC appears to have developed in a manner endowing it with sensitiveness to the changes in the universe of subjects. Further, through continuous active developmental research, CC has been steadily improving upon its ability to meet the varied and changing requirement of readers. The sociology of the

development of CC has been described (11). Its design, structure, and mode of development have demonstrated the soundness of the Indian Thought in Classification and the possibility of its use as a basis and its implementation in practice, by any scheme for classification.

023 REQUIREMENT OF READERS

The study of the requirement of readers and the patterns of document usage by different categories of readers for different purposes is a field in which library science has to work with and draw upon other disciplines such as the Behavioural Sciences. Some investigations done in these border fields have been referred to in an earlier paper (15).

1 PRESSURE OF THE UNIVERSE OF SUBJECTS

In the succeeding sections, the implications of the findings of the study of certain attributes of the universe of subjects to the classificationist and to the classifier are briefly discussed. The need for the study and the attributes of the universe of subjects that may be studied by the librarian have been dealt with in Paper Q in this issue.

11 TURBULENTLY DYNAMIC

In the development of the universe of subjects

1 The rate of contribution of seminal and near-seminal ideas has been increasing through the centuries;

2 In recent decades the frequency of their impact on and disturbance of, the course of the development of subjects is becoming appreciable; and

3 The development of the universe of subjects is tending to be turbulently dynamic (4).

12 INFINITE

Subjects of different intension and extension are being thrown forth incessantly due to the increasing facility for scholarship, research, dissemination of knowledge, and consequently for the cultivation of the universe of subjects.

13 CONTINUUM

Fallow and uncultivated regions in the universe of subjects are getting filled up much faster than ever before. In recent years new subjects with new kinds of interrelation among the constituents and/or with the known subjects have emerged more frequently, than say half a century ago. Each of the new entities has to be placed in a helpful position in the universe of subjects.

14 MANIFOLD MULTIDIMENSIONAL

The universe of subjects is manifold multidimensional (12). In library classification such a universe is to be transformed into a one-dimensional linear arrangement. In an ideal arrangement of the documents and the main entries for them satisfying all kinds of reader-interests at all times, it would be necessary to obtain an Everywhere-Apupa arrangement of the subjects (52). To achieve, this it is necessary to keep invariant every Immediate-Neighbourhood-Relation among all the subjects, in the process of transformation of the manifold multidimensional universe of subjects. This has been shown to be impossible with the available techniques of library classification (53).

15 IMPLICATIONS

Study of these attributes of the universe of subjects have implications on the work of the classificationist and of the classifier. It is realised that

1 A scheme for classification and the methodology for its design and development that were adequate to meet the state of the universe of subjects, say, a century ago is inadequate to meet the requirements of the classification of the universe of subjects in its present state:

2 Today, a methodology for the design and development of schemes for classification is likely to become inadequate and obsolete at a much faster rate than it might have done a century or even half a century ago; and

3 Methods should be developed to overcome such a quick obsolescence of the design methodology.

16 FIELD OF RESEARCH

Thus, the classificationist and the classifier are, on the one hand, being continuously challenged by the universe of subjects; and on the other, they are challenged by the demands of the Laws of Library Science. The motivation for and the field of research in classification lies in meeting these 'two ever-present challenges.

The broad and specific lines of research and development in classification are outlined in the succeeding sections.

2 LINES OF RESEARCH AND DEVELOPMENT

21 BROAD LINES

A study of the theory and practice of classification during the last half a century indicates three broad lines of research and development to meet the challenge mentioned in the preceding section.

211 CLASSIFICATION AS THE FOUNDATION

It is being realised that an efficient classification provides a sound foundation for a document retrieval system, whether it is a conventional kind or whether machinery is used for search and retrieval (3, 5, 8, 28, 31).

212 HOLISTIC APPROACH

It is realised that classification alone cannot meet every kind of reader-approach to documents. It is more productive to design it to serve the majority-approach. A holistic view of the document retrieval system suggests that classification should leave to the other library tools and methods — such as the library catalogue, reference service, and administrative method — what they can do better than itself (27).

213 RESILIENCE IN DESIGN METHODOLOGY

It is also being realised that the more productive method of meeting the challenges of classification of the dynamic universe of subjects is through building into the methodology for the design of schemes for classification the capability for phased development and self-perpetuation in order to

- 1 Minimise the chances of quick obsolescence of the methodology;
- 2 Achieve stability in the structure of the scheme for classification; and
- 3 Achieve consistency in the progressive improvement of the methodology, at least so long as there is no sudden mutation in the human thinking process.

22 SPECIFIC APPROACH OF THE INDIAN SYSTEM OF THOUGHT

The principal lines of research and development from which CC draws heavily may be summarised as follows:

- 1 Use of the Laws of Library Science as the basis for research, development, and evaluation of the efficiency, of classification;
 - 11 Enunciating postulates and principles for guiding the work in the subject;
 - 12 Blending the *a priori* and pragmatic approaches;
 - 2 Demarcation of the work involved in the design and development of schemes for classification and of classifying as belonging to three planes of work — Idea Plane, Verbal Plane, and Notational Plane;
 - 21 Assigning paramountcy to the work involved in the Idea Plane;
 - 3 Diving deeper to the near-seminal level, bypassing the confusing picture presented by the phenomenal level;

31 Not getting involved in too many details, when such details can be dealt with more conveniently at the later stages in the work;

32 Assigning a scale of priority of consideration and solution among the different problems that may come up simultaneously;

4 Progressively making the work of the classificationist and that of the classifier more productive;

41 Progressively making the design and development work more and more amenable to objective scientific method;

42 Progressively reducing the number of situations making us depend on flair and subjectivity;

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

5 Formulation and use of precise terminology for the discipline.

In the succeeding sections these lines of work are briefly discussed and illustrated.

3 PRINCIPLES FOR GUIDANCE

31 FUNDAMENTAL LAWS

The Fundamental Laws of Library Science were formulated in India in 1928 and published in 1931 (38). Till then library work was largely a trial and error affair. When occasionally a difficulty arose, flair and experience helped the librarian to get over it. Pressure of the universe of subjects and that of readers' requirements were not appreciable. The full potentialities of library service for social good were not realised either by the profession, or by the readers, or by the State. A few able men such as Cutter, Dewey, Richardson, Sayers, and Bliss formulated some intellect-based independent empirical principles for subject cataloguing and for classification. A unifying set of fundamental laws for the subject as a whole, that can be used as the basis to derive principles both empirically and by deduction was needed. The five Laws of Library Science filled the need. These were intuition-based.

32 POSTULATES AND CANONS

In the last three decades postulates, canons, and principles conforming to these fundamental laws have been formulated for classification (45). The postulates, the Wall-Picture Principle and a few canons were intuition-based. All the other canons and principles were empirical and intellect-based. These have facilitated the examination of the rationale behind the various deve-

lopments in the subject in the past and in the present, and also the prediction of the likely developments in the near future. The ideas forming the basis of the theory and practice of classification could be viewed in the proper perspective in terms of the pressure of the universe of subjects and of readers' interests and its role in library service as a whole. Thus, a guide-line for research and development, a standard to conform to, and a system of control at each stage of the work, was made available. This, in turn, helped to increase the consistency, stability, and reliability of the foundation for classification and of the practice built on it.

33 POSTULATIONAL METHOD

Faced with the challenges of a continually changing universe of subjects and the complex and varying demands of a universe of readers, it has been found helpful to base classification on a set of postulates, largely intuitively grasped (48). The work proceeds with these as the basis. The helpfulness or otherwise of the postulates gets tested. The postulates may be modified or new ones may be added if the situation warrants. The postulational method has, in fact, helped the evolution of the Freely Faceted Classification.

34 EVOLUTION OF FREELY FACETED CLASSIFICATION

Even to arrive at a pattern of the constituents of compound subjects going with a Basic Subject may require extensive statistical investigations, on a reliable random sample of macro and micro documents, about the incidence of facets, the pattern of their sequence, and about the pattern preferred by the majority of readers. Further, such studies will have to be done periodically to recognise any change warranted by the changes in the universe of subjects or the subject-approach of readers. However, library service cannot wait until all such investigations are completed. It must go on empirically until the application of statistical analysis provides a trustworthy basis.

341 DIFFERENT REFERENCE POINTS

Usually, a classificationist keeps some one entity as the point of reference and arranges the other entities in the universe of subjects in a certain sequence according to the conjecture made by him or on the basis of experience to be the most helpful to the majority of readers. Human experience, and intellection, have limitations, because they are doer-dependent to some degree or other. Therefore, the classificationist gets only a truncated view of the universe of subjects as a whole at a given point of time. Hence, the methodology for the design of a scheme for classifi-

cation may vary with different classificationists and with time even with the same classificationist.

342 DIFFERENT INVARIANTS

The work of successive classificationists shows that some of them have preferred different invariants. For instance, the invariant preferred by DC, EC and LC were not substantially different. The invariant preferred by the Subject Classification shows an essential difference centering round the Categorical Tables.

343 METHODOLOGY OF CC

The invariants preferred by CC are still more different and of a complex kind. The essence of the difference centres round its Phase Analysis and Facet Analysis, based on its Postulate of Basic Subject, Fundamental Categories, and Rounds and Levels and Sector Analysis. The postulational method has helped it to move on from being a rigidly-faceted to a freely-faceted classification. Since 1963, compound subjects with varying number of facets, but all going with the same Basic Subject, have been studied in the Research Cell of DRTC, for more than a hundred Basic Subjects. All this amounts to developmental research. The number of facets, presented by compound subjects studied, has been found to vary from 2 to 30 facets, with several characteristics being used in each of the facets. For example, in a recent work (24) combination of as many as 105 qualifiers have occurred in [IP1] alone. Compound Subjects with even greater complexity are sure to emerge. It is not practicable to anticipate all such newly emerging facets, etc. At the time of the design, the classificationist can anticipate only a few of them. The rigidity of the Facet Structure gets completely removed in a 'Freely Faceted Classification'; that is, a classification guided by explicitly stated postulates and principles for the three planes of work, and involving the analysis of the subject into its facets in the idea plane, transformation into focal terms in the verbal plane using current standard terminology, their translation into focal numbers in the notational plane according to a scheme for classification, and synthesis of the focal numbers into the class number. Such a methodology has been shown to have better capability than other models such as the purely enumerative, almost-faceted, or rigidly-faceted classification to coextensively classify micro subjects (37). This design methodology based on postulates about the structure and development of the universe of subjects theoretically admits of the addition of a large number of characteristics one after another in a large number of facets to be added one after another

in the classification of the universe of subjects. That is, it is fitted to deal with the universe of subjects as a manifold multidimensional universe (See Sec 14).

In another paper (10) the helpfulness of the postulational method in regard to the enumeration of Basic Classes and the building of Class Numbers has been dealt with.

35 BLENDING OF THEORY AND EXPERIENCE

While the postulates provide a theoretical basis for the subject, the relevance to and utilisation of the ideas in the actual day-to-day library service is ensured by blending this *a priori* approach with the experience gained in day-to-day library experience. The theory and principles may emerge from observations on and actual experiences in, library service, and in turn they provide the basis for further developments in the subject. The development of CC is itself an example of this (29). The provisional schedules were designed in 1925, used in the Madras University Library, the reaction of readers studied, and suitable modifications incorporated in ed 1 of the work published in 1933. The observations and experiments were continued and necessary modifications incorporated in the theory. In the meanwhile, the Five Laws were formulated in 1928, providing a fundamental basis for testing the new classification. In 1927 the first consolidation of the theory of classification was published (43). On the basis of the theory, CC itself was evaluated along with other schemes for classification. The faults and inconsistencies found in CC were removed in its ed 2 of 1939. More experience was gained through the wider use of CC. At the same time, new postulates and principles were formulated as guide-lines. The researches and developments in classification theory and methodology were consolidated in ed 2 of the *Prolegomena* (1957). By then CC had run into five editions. The suggestions emanating from ed 2 of the *Prolegomena* were incorporated in ed 6 (1960) of CC.

About this time began research into the methodology for the design of schemes for classification of micro subjects needed for documentation. New problems were faced. Ideas were clarified and new methodologies developed. A piece of fundamental research led to a break-through in 1963 (33). This opened up considerable scope for applied and developmental research. Refined techniques were developed and empirical guiding principles were formulated for specific items of work in design (17, 18, 20, 21, 23). The findings of the research done during the decade 1957-66 were consolidated and assimilated in ed 3 of the *Prolegomena* (1967). Ed 7 of CC (in preparation) is to conform to these latest findings. The main developments in the theory and practice of CC at different stages of its evolution have been

discussed elsewhere (16). And so the cycle of blending the theory and practice goes on.

36 DEPTH CLASSIFICATION DESIGN

Apart from this overall pattern of development, the blending of the *a priori* and pragmatic approaches may be seen in specific work as well. In several of the steps in the design and development of schedules for depth classification the two approaches are required to be blended (22).

37 SCOPE OF DEVELOPMENTAL RESEARCH

Although there has been continuous progress in the work of designing and developing depth schedules, we are far from reaching the ideal in design work. The work done till now has disclosed several problems, which have to be solved by developmental research. Statistical frequency studies have been of help at many points (19, 25, 26, 57). From time to time the developmental research done leads to the formulation of some guiding principles which lighten the design work in later stages. Naturally, this process will continue for ever. The scope for developmental research in classification is indeed unlimited.

4 THREE PLANES OF WORK

About 1951 the idea of separating out the work of design and development of a scheme for classification and also of classifying as belonging to three planes — Idea Plane, Verbal Plane, Notational Plane — was conceived of (42).

41 OVERALL ADVANTAGE

411 SYSTEMATIC RESEARCH MADE CONVENIENT

This separation has been of considerable help in doing research in classification in a systematic manner. For, the work in each of the planes could proceed without being inhibited or hampered by any problem encountered in any of the other two planes.

412 WORK IN IDEA PLANE COMMON

The work in the Idea Plane was seen to be the same or at least similar in the designing of a scheme for classification, and also in the analysis of the subject of a document for classifying it whatever be the scheme designed or used. This work consists of the delineation of the structure of the universe of subjects, sensing its modes of development, recognising the kinds of relations among the constituents of the subjects, and postulating

about the pattern of relation and helpful sequence among the constituents. As this work concerns the intrinsic attributes of the universe of subjects it cannot vary from scheme to scheme or from one system of document retrieval to another.

413 GENERALITY OF THE POSTULATES AND PRINCIPLES FOR IDEA PLANE

Every methodology for the design of a scheme for classification has necessarily to deal with the attributes of the universe of subjects mentioned above. Therefore, the postulates and principles for the Idea Plane developed by the Indian System of Thought are available not only for the design and development of CC alone. They are available in equal measure for the development of other schemes for classification also.

In classifying, the steps 0 to 5 of the postulational method (49) are applicable to the analysis of the universe of subjects embodied in documents without specific reference to any scheme for classification. It is only from this step onwards one could proceed either to synthesise the Class Number according to a specific scheme for classification or to use the kernel terms in the transformed title for deriving feature headings and subject headings (54).

414 PARAMOUNTCY OF THE IDEA PLANE

This led to the realisation that the work in the Idea Plane is paramount. It sets the objective to be achieved. The Verbal Plane should be designed to facilitate the work in the Idea Plane. The work in the Notational Plane was clearly seen as nothing more and nothing less than that of implementing the findings of the Idea Plane.

415 ESSENCE OF THE DIFFERENTIA AMONG DESIGN METHODS

Thus, it became clear that the measure of the efficiency and the essential differentia among the methodologies for the design of a scheme for classification largely depend on how well each methodology helps to analyse the structure of the universe of subjects and features it in a helpful way for the reader. The kind and the length of notation, or the differences in the Verbal Plane are only superficial considerations in comparing the methodologies (39).

416 CLASSIFICATION AND RETRIEVAL BY MACHINE

It is also beginning to be realised that the efficiency of the work in the Idea Plane is an essential consideration for the better

use of the abilities of machinery for document retrieval. In other words research into methods for the holistic co-operation of the powerful analytical tool — classification — and the rapid searching ability of the machine, could be a fruitful line of work in developing efficient document retrieval systems (55).

42 INHIBITIONS

A few examples of the difficulties in research due to the non-separation of the planes of work are mentioned here.

421 FREEDOM FOR THE LAST FACET ONLY

Work in the Idea Plane may be inhibited by our concern for the limitations of the Notational Plane. For example, though a subject may present distinctly two or more facets, the limitations of the monolithic notation inhibited DC from giving equal weightage and facility for the development of each of the facets. The findings of the Idea Plane were per force ignored and only the isolate in the last facet has been given the full freedom of further division and all the other facets were frozen. CC introduced a connecting digit for separate recognition of each of the facets and also for connecting them in a Class Number. This facilitated the overcoming of the inhibition and implementing the findings of the Idea Plane. Each of the isolates in each of the facets could be divided to any extent without difficulty. This was an important first step in a series of further researches in classification.

422 WHOLE AND NON-WHOLE

The concepts of whole universe and non-whole universe were sensed and brought into use in 1953 (56). The array of Order 1 in the schedule for [1P1] going with the Main Class Y Sociology is made of quasi-isolates. Each quasi-isolate starts its own Train of Characteristics. The occurrence of several Trains of Characteristics led to an inhibition in the Idea Plane. It was not clearly recognised that a combination of the isolates drawn from the schedules derived on the basis of two or more such Trains of Characteristics still belonged to [1P1] only. Therefore, the isolates drawn from the different Trains of Characteristics were treated as if they belonged to different levels of [P] spite of their combination still yielding only whole entities. The isolates from whole entities and non-whole entities were not distinguished and marked off. Once the position was clarified in the Idea Plane. — the use of a complex Train of Characteristics yielding whole isolates, that is, as a Qualifier — it led to a breakthrough in the design of depth classification (33). The change is illustrated in the following example:

Isolate term	(CN) according to		
		Earlier concept	Correct representation
Road engineering	..	D411	D411
Macadamised road	..	D4113	D4113
Stone paved road	..	D4114	D4114
Reinforced concrete road	..	D4116	D4116
Foundation	..	D412	D411,1
Earth work	..	D413	D411,2
Surface	..	D417	D411,7

423 QUALIFIER IDEA

Till the recognition of the idea of 'Qualifier' (See preceding section) a confusion persisted in the Idea Plane due to "the spell caused by the new experience with the concept of (FC)". Consider the subject "Repair of cardboard box". The entity 'Box' was taken to belong to [P]; and the entity 'cardboard' was taken to belong to [M]. Thus the facet formula was taken to be

[Box]; [Cardboard]: [Damage]: [Repair]
[1P]; [1M]; [1E][2P]; [2E].

This sequence would make it appear that 'Damage' pertained to 'Cardboard' and not to 'Box'. This confusion in the Idea Plane was giving trouble for several years. In 1963 the trouble was traced to the initial error of considering 'Cardboard Box' as a composite term and breaking it into a 'Personality Term' and a 'Matter Term'. It is now seen that the term 'Cardboard Box' as a whole should be taken to be the 'Personality Term'. That is, in classifying the universe of entities in [P] consisting of 'Boxes', the material of which the boxes are made is to be used as a First Characteristic — that is, Quasi-Isolate or Qualifier. The resulting division will still be a whole of the typical entity 'Box'. As mentioned in Sec 422 this clarification in the Idea Plane was an important break-through in the design of schemes for depth classification. It was a piece of developmental research achieved

through clarification of ideas. It gave considerable scope for further applied and developmental research in the design of depth schedules.

424 ZONES

The use of different species of digits in the mixed base in the Notational System of CC suggested the formation of Zones in the Notational Plane. This suggestion was taken to have correlate in the Idea Plane (44). This made CC to allocate the Zones in the Notational Plane to the Zones in the Idea Plane in the following way:

Roman smalls	..	Enumerated Common Isolates
Arabic Numerals	..	Enumerated Special Isolates
Roman Capitals	..	Devised Special Isolates
Packeted Numbers	..	Devised Common Isolates

This kind of allocation in the Notational Plane gave rise to the inhibition that there might be conflicts if there is any deviation from this pattern. This led to a rigidity in the notational system.

The new methodology for the design of depth schedules (34) gave a census of the sectors available for use in the Personality Facet, and also a pattern of their allocation. However, there persisted an inhibition to allocate (S—a) to the Special Isolates in [P]. When depth schedules were developed for compound subjects going with different Basic Subjects in Commodity Production Engineering, a large number of quasi-isolates had to be used in [IP1]. With the boundary condition of not more than three digits in an Array Isolate Number and conforming to the other conditions for the allocation of sectors to the quasi-isolates (23), the available sectors were found inadequate. This led to an examination of the use of (S—a) in [IP1]. The problems that arose were resolved by a special use of "0" (zero). It was seen that there will not be any conflict or homonym in Class Number in the use of (S—a) for the special isolates in [P]. The inhibition in the Idea Plane was removed. It led to the use of "0" (zero) as a Sectorising Digit. Extrapolation among the Main Classes earlier to "a" was shown to be possible. The number of sectors in each of the other Zones was increased in addition to creating a Zone 0 earlier to Zone 1 (21).

425 ENERGY ISOLATE AND MATTER ATTRIBUTE ISOLATE

In the early years of the development of CC an Isolate not deemed to be a manifestation, either of Time, Space, or Personality, was denoted by the term "Problem". An isolate in the 'Problem Facet' was deemed to be a manifestation of Energy — that is, an action of one kind or other. In this facet, isolates such as Morphology, Physiology, Disease, Hygiene, etc were placed.

Although it was difficult to see any action *qua* action involved in the idea denoted by these terms, they were forcedly treated as Energy isolates. The trouble was due to a trickery in the Verbal Plane — the use of the all-comprehensive term "Problem" for any isolate that was not a manifestation of Time, Space, or Personality. In 1957 the idea of viewing 'Property' as a manifestation of the (FC) Matter, began to develop. It was largely thought of in relation to the work on the designing of depth classification schedules. By 1958, when the work of constructing a schedule of Common Property Isolates was planned, it was sensed that the (FC) matter may manifest itself not only as a Material Constituent but also as an Attribute Constituent. However, the isolates in the schedules of CC do not appear to have been examined systematically from this angle till about 1966. Early in 1966, when the work of revising the *Prolegomena* was taken up, it was recognised that certain isolates enumerated in the schedules for Energy in CC were Properties of entities and therefore, should be deemed to be manifestation of the (FC) Matter. Thus, it has been found helpful to deem the manifestations of Matter as of two kinds:

- 1 Property, named as Matter (Attribute); and
 - 2 Material, named as Matter (Material),
- each constituting a level of the (FC) Matter.

Once the inhibition caused by the Verbal Plane was realised, the Matter (Attribute) isolates could be separated from the Energy Isolates in the 'Problem facet' of CC. The sorting out of the Energy Isolates in the schedules of CC is a piece of developmental research to be done. In turn it is likely to lead to further research in the design of schedules.

5 WORK AT NEAR-SEMINAL LEVEL

51 FUNDAMENTAL CATEGORIES

At the phenomenal level of isolates the claims for Immediate-Neighbourhood-Relation among them is confusing and it is difficult to arrive at any consistent decisions about them. The number of facets arising out of the totality of specialised micro subjects are too many for individual enumeration. Therefore, their reduction to a comparatively smaller number of primordial facets was helpful. Even these were of too many varieties at the phenomenal level to show any definite pattern of relation among themselves. Hence through a deep dive to the near-seminal level aided by intuition revealed that they could all be reduced to five fundamental patterns. This gave rise to the postulate of five Fundamental Categories — Time, Space, Energy, Matter, and Personality. Then followed without much difficulty the other postulates such as those about the relative concreteness of the

(FC) and their sequence. The concept of (FC) is to be distinguished from the concept of category qua category used by some writers on classification (9, 13). Their concept appears to emerge from and parallel to that of philosophers beginning with Aristotle.

52 MODES OF FORMATION OF SUBJECTS

It is difficult to discern the pattern of relation among the constituent isolates in a subject. There is also uncertainty about the development of the universe of subjects. But, diving deeper beyond the combination of isolates in different subjects, it has been possible to recognise a few modes of formation of subjects such as dissection, Denudation, Lamination, Quasi-Lamination, and Loose-Assemblage. Partial Comprehension, Subject-Bundle, and Bundle of Subjects are met with at document level. For each mode of formation of subjects some particular kind of relation arises among the entities concerned (51). The Notational System has to develop sufficient versatility to accommodate each such pattern of formation in the universe of subjects. In CC, the kinds of Hospitality provided for are: Hospitality in Array; Hospitality in Chain; Hospitality among Quasi Isolates; and Hospitality among Facets (50). These were got largely by intellect-based research. The research on the devices for hospitality in the Notational Plane has almost been continuous and much has been achieved. This will be elaborated in a later paper by M N Kanbur.

53 BOND THEORY

At the near-seminal level, it has been possible to discern different kinds and degrees of relation among the constituent isolate ideas in a subject. A Bond Theory of Subject-Structure has been formulated (30). This was intellect-based research. The structure of the Class Number should express the particular kind of relation recognised among the constituents of the subject. For example, the CC Class Number does not merely denote a distinctive facet in it to represent the constituent kernel idea and nearly all the characteristics used in deriving the isolate idea in each of the facets, but it also denotes the strength of bond between the constituents of the subject. An account of the connecting digits used in CC and UDC will appear in a later paper by R S Parkhi.

54 GROUPING OF QUASI ISOLATES

In the arrangement of the Quasi Isolates in a helpful sequence in [IPI], it was found helpful to use the Wall-Picture Principle (35). However, when the number of quasi isolates used in [IPI] was large, the arrangement of the quasi isolates by taking

two of them at a time for the application of the Wall-Picture Principle became a tedious process. Therefore, an attempt was made to find out affinities among the quasi isolates used in [IP1]. In recent work on their grouping in [IP1] for subjects going with Basic Subjects in Commodity Production Engineering in particular, it has been shown that

1 The quasi isolates can each be correlated with one or the other of the Fundamental Categories, FMEST;

2 The quasi isolates could then be arranged in the FMEST sequence; and

3 The sequence of the quasi isolates thus derived is the same as that derived by applying the Wall-Picture Principle successively to the quasi isolates, taking two at a time.

This was largely intellect-based research.

It demonstrates the potency of the Wall-Picture Principle which was an intuition-based formulation.

This going down to the near-seminal level has given a clue to the pattern of arrangement of the isolate ideas in [IP1] in subjects going with the Basic Subjects in Commodity Production Engineering. The conjecture is that a similar pattern of isolates may obtain in the Personality Facet for subjects going with other Basic Subjects also. The experience, in the design of depth schedules for subjects going with Basic Subjects in Chemical Technology and in Social Sciences, supports this conjecture. This has to be verified through developmental research in the design of depth schedules for subjects going with different Basic Subjects.

55 ABSOLUTE SYNTAX OF THOUGHT SEQUENCE

A subject is largely the product of human thinking. It presents an organised pattern of ideas created by the specialists in a field of enquiry. Working at the near-seminal level and postulating about the helpful sequence among the facets and among isolates, has now led to the conjecture that there may be an 'Absolute Syntax' among the constituents of subjects going with a Basic Subject, perhaps parallel to the sequence of thought-process itself, irrespective of the language in which the ideas may be expressed, and irrespective of the cultural background or other differences in the environments in which the specialists—as creators as well as the users of subjects — may be placed. The sequence of the constituents of the subjects going with a Basic Subject, derived by the Wall-Picture Principle, is conjectured to approximate this Absolute Syntax of Facets. This is a field for co-operative research and testing by specialists in psychology, statistics, linguistics, anthropology, reference service etc. (40). The other Principles for Facet Sequence, and the Principles for Array Isolate Sequence (46) are intellectual derivations of the Wall-Picture Principle.

56 PRIORITY ASSIGNMENT

Working at the near-seminal level has helped to bypass too many details when such details could be dealt with more conveniently at later stages in the work. Further, the work could be so organised as to give an overall higher productivity.

561 REFINEMENT OF DESIGN METHODOLOGY

When the new methodology for the design of depth schedules was formulated in 1963 (33), priority was given to the testing and demonstrating its workability and helpfulness. A number of schedules for subjects going with certain Basic Subjects were constructed. The Basic Subjects were drawn from Commodity Production Engineering. In this subject the isolates are concrete and recognisable by the primary senses. Thus the difficulty likely to be caused by abstract isolates was temporarily eliminated. After ensuring that the methodology was workable with this restricted assortment of Basic Subjects, steps were taken to refine the methodology so as to achieve higher productivity in the work — for example, in the arrangement of quasi isolates in a helpful sequence (18, 20), in the allocation of sectors to the quasi isolates (23), shortening of the notation, and formulating a step-by-step procedure for the work of designing a depth schedule (22). If the work was not organised on the basis of a scale of priority, the research team would have involved itself in too many details simultaneously. In such an involvement either the progress would have been very much slower or the whole pursuit would have been abandoned in despair.

562 REDUCTION IN THE WORK OF DESIGN

It has been possible to recognise the particular facets of subjects wherein the development is comparatively more rapid and significant. For example, it was conjectured and confirmed by experience, that the isolates in the [P] change comparatively more frequently than those in other facets. Further, they were also found to be the most numerous and largely special isolates. These findings indicated that the classificationist should first concentrate on the construction of the schedule for the [P], and particularly for [1P]. The schedules for the different kinds of common isolates could be drawn up for the scheme as a whole, and not *de novo* for each of the compound subjects going with different Basic Subjects. The Quasi Common Isolates could be derived without much difficulty from the enumerated Common Isolates using the Principle of Seminal Equivalence.

57 SEMINAL MNEMONICS

The Canon of Seminal Mnemonics is a result of grasping the identity of ideas occurring in different subject contexts at

great depth, beyond the reach of the natural language. It is possible to have the same concept represented by the same digit in all places of its occurrence, but with different terms in the natural language denoting it in different places. The seminal concepts and the digit for them have a "many-one" relationship. The Class Number formed with such seminal mnemonic digits satisfy the Canon of Filiatory Sequence and of Helpful Sequence. The Canon of Consistent Sequence is also satisfied in a subtle way. The helpfulness of Seminal Mnemonics has been examined (1, 2).

6 CONTINUITY, DEVELOPMENT AND PRODUCTIVITY

61 ORGANISATION FOR RESEARCH

An overall programme of research in classification has been outlined (32). That programme provides for a systematic feed-back between fundamental research, applied and developmental research, and controlled testing through pragmatic research. It also envisages the global participation of teams of persons engaged in *a priori* research in classification, and librarians at service points engaged in pragmatic research in the subject. When properly implemented such an organisation will lead to a continuing programme of research in classification on a large-scale.

62 FACILITY FOR TEAM WORK

To facilitate such decentralised team research at various levels in designing and testing schemes for classification of subjects going with different Basic Subjects, formulation of guiding principles for the different steps in the design methodology is being done (22). The incidence of flair and subjectivity in the work will get progressively reduced. By making the work progressively more and more amenable to objective scientific method, controlled development at every stage of the work will become practicable. This, in turn, will increase the reliability of the findings at each stage (14).

63 REVISION OF SCHEDULE BY PARTS

In a Freely Faceted Classification, with its base on a sound theory, it is possible to revise the schedules for subjects going with particular Basic Subjects in the light of the new developments in those subjects, with least disturbance to the whole structure of the classification. In particular any re-assignment of isolates will involve change only within a short range of the sequence of subjects. It will not involve tidal changes such as transferring a compound subject from the core of one basic subject to another. The whole scheme will get renovated by parts and in stages. The

scheme will be able to keep step with the changes in the universe of subjects, and its expectation of productive life will be considerably increased. Only in exceptional epochs of turbulence in the universe of subjects, say once in three to five centuries, there may be a total shake up of the foundation itself and a new methodology may have to be worked out perhaps leading to major changes in the scheme for classification.

7 STANDARD TERMINOLOGY

71 VERBAL PLANE

An idea, whether it is intuitively grasped or intellectually developed, has to be communicated through expression in a language. The development of a discipline depends largely on its cultivation by the intellectuals through mutual communication. The most widely used medium for this purpose is the Verbal Plane. Even in thinking, that is, in communicating with oneself, one has to take the help of the Verbal Plane as the medium. Thus, for "absorbing" as well as for "cultivating" the universe of subjects, the Verbal Plane is an essential medium.

72 INTERNATIONAL INTERCOURSE

The few specialists in a subject are not always concentrated in one country. They are usually scattered among different nations with different languages, cultural background, educational development, and traditional ways of approaching a problem. Further, research in a subject requires contact with specialists in other subjects also for the purpose of mutual enrichment.

73 NOISE-FREE COMMUNICATION

The communication among the research workers in a discipline will be most efficient if there is one-to-one correspondence between the idea and its expression in the Verbal Plane. There should be no noise or leakage introduced in the communication. For, they will lead to wastage of intellectual potential through misunderstanding and wrong interpretation of the expression of a thought in the Verbal Plane. The chances for this are greater, when research is to be done by a large number of teams of intellectuals. Standardisation is out of bound when we communicate with the layman — that is, the non-specialist. But at the deep level where new thought is being created, standardisation will be helpful. For, once a new thought is created by two persons, unless they use an agreed standard term to denote it, they cannot communicate with each other effectively. As a result productivity will be lessened. Faults of mixed terminology, homonym, synonym, inexactness, inconsistency — these and other

faults are usually incident in the Verbal Plane. An aberration in the Verbal Plane can even lead to distortion in thinking (See also Sec 425). Although the Idea Plane should develop independently of the Verbal Plane, it is practically impossible to separate an idea from its name. The troubles caused by such faults in the Verbal Plane may be insignificant and innocuous in our day-to-day activities because of the concreteness and immediacy of the context. But in laying the foundation of a subject and in developing it, it is necessary to take steps to remove such pitfalls in communication (36).

74 STANDARDISATION

Specialists in various disciplines, particularly in the natural sciences, have found the development and use of standard terminology helpful in effective communication. In the discipline of classification too a standard terminology is necessary to promote research in it. Standardisation does not mean that the terminology will be frozen for ever. As knowledge keeps growing, we put a meaning to a word. When the meaning is, in due course, fully developed the word may not be able to hold the entire meaning. Then we have to replace it by another word or by a term of two or more words. In other words, a standard terminology will itself grow and will not be frozen.

75 WORK BY THE INDIAN SYSTEM OF THOUGHT

In the field of classification a set of standard terms has been developed over the past 30 years—from the time of the publication of the first edition of the *Prolegomena*. These have now been incorporated in an Indian Standard (6). The terminology is being refined from time to time and new terms are being added as and when necessary. The latest version of the terminology may be found in the *Prolegomena*, ed 3 (1967).

76 INTERNATIONAL STANDARD TERMINOLOGY

Ultimately we want standard terminology not merely in each language; it will be helpful if it is practicable to develop a single standard terminology for all languages covering the subject of classification. If this is not practicable every effort should be made to choose cognate terms from different languages to denote an idea to the extent to which this is possible. It is gratifying to note that ISO/TC46 has taken a move in this direction (7). However, much remains to be done before we can think in terms of an international multi-lingual glossary of standard terms in classification.

8 PROBLEMS FOR PURSUIT**81 ENUMERATION**

Periodically the problems for pursuit have been enumerated in the successive editions of the *Prolegomena*. This helps to programme the research work on systematic lines and also to organise it in a productive way among different teams. As the research work proceeds some problems get solved while new ones are added to the list.

In recent years, a number of attempts have been made to formulate mathematical models of document retrieval systems and to use probability theory, information theory, matrix theory, combinatorial theory, numerical analysis, and mathematical logic for this purpose.

82 SUBJECTS FOR RESEARCH

Given below is a list of the subjects for research. Most of these are enumerated in ed 3 of the *Prolegomena*.

83 PROBLEMS IN THE IDEA PLANE

1 Application of the Laws of Interpretation to the different design methodologies.

2 Break-even point between a composite concept and its fundamental constituent concepts.

3 Laying down principles and tests for a subject to be deemed a Basic Subject.

4 Formulation of additional principles for 'Facet Sequence'.

5 Isolation of new phase relations.

6 Guiding principles for determining the correct modulation in fixing the successive links in a chain of subjects or isolate ideas — that is, the determination of the appropriate resolving power at each step.

7 Comparison of the syntax of facets with the Absolute Syntax, if any.

8 Formulation of different systems of postulates and their comparative study.

84 PROBLEMS IN THE NOTATIONAL PLANE

1 Explicit and objective determination of seminal mnemonics.

2 Principles for allocation of sectors to the quasi isolates.

3 New devices for shortening of notation.

4 Possibility of use of planar notation.

85 PROBLEMS IN RETRIEVAL WITH COMPUTEK

1 The use of Class Numbers in programming for retrieval by computer.

2 Optimum depth of analysis of subjects for use of computer for search and retrieval.

86 PROBLEMS IN ABSTRACT CLASSIFICATION

1 Guiding principles for the formulation of a consistent, necessary, and sufficient system of postulates.

2 Lemmas for working on abstract classification.

3 New methods for analysis.

4 Establishment of different models of classification in the abstract.

5 Establishment of a consistent system of symbols for universal use to secure brevity and precision in communication of ideas on classification.

6 Establishment of a system of a symbolic meta-language to facilitate the study of classificatory language of ordinal numbers as objective-language.

7 The practicability of retaining the postulate that the Energy Facet should have only one array.

9 BIBLIOGRAPHICAL REFERENCES

1 Sec 57 ABDUL RAHMAN and RANGANATHAN (T). Seminal mnemonics. (An lib sc. 9; 1962; Paper E).

2 Sec 57 — and —. Array isolates and seminal mnemonics in CC. (An lib sc. 9; 1962; Paper T).

3 Sec 211 BATTEN (W E). Future of information work. (Aslib proc. 19; 1967; 170).

4 Sec 11 BAVADEKAR (P N), CHANDRASEKHARA SASTRI (K), CHELLAPPA (C), and RANGANATHAN (T). Rate of development of the universe of subjects, etc. (DRTC Seminar (5) (1967). Paper A).

5 Sec 211 FARRADANE (J). Scope of research in education in information science. (Intern Conf Educ Sc Inform Work (London) (1967). Papers accepted for discussion. Area V, Paper 3).

6 Sec 75 IS: 2550-1963 INDIAN STANDARDS INSTITUTION. Glossary of classificatory terms. 1963.

7 Sec 76 ISO/TC46 (FID/DH 6) 814*a*. INTERNATIONAL STANDARDS ORGANISATION. (Classification terminology). (Draft). 1967.

8 Sec 211 LIBBEY (M A). Observations. (*In* Ranganathan (S R). Descriptive account of Colon Classification. 1967. US ed. 1965. Sec ZT1).

- 9 Sec 51 MANE (B S) and RAIZADA (A S). On modern classificatory theory. (An lib sc. 10; 1963; 97-102).
- 10 Sec 343 NEELAMEGHAN (A). Analytico-synthetic classification in perspective. (Lib sc. 3; 1966; Paper L, Sec 4 and 5).
- 11 Sec 022 —. (Sec 8).
- 12 Sec 14 —. New developments in library classification in India. (*In* Atherton (P), *Ed.* Classification research. 1965. P 506, Sec 331).
- 13 Sec 51 —. Sec 335.
- 14 Sec 62 —. Research in library science. (Lib sc. 4; 1967; Paper C, Sec 3).
- 15 Sec 023 —. —. Sec 74.
- 16 Sec 35 — and GOPINATH (M A). Concepts forming the basis of Colon Classification: Development and use in the design of classification (1925-65). (IASLIC (1965) (Trivandrum). Working papers. P 1-30).
- 17 Sec 35 — and —. Division of an array isolate in [IP1] and in later level: Case study. (Her lib sc. 5; 1966; Paper ZC).
- 18 Sec 35 — and —. Grouping of quasi isolates. (DRTC 561 Seminar (4) (1966). [Papers and proceedings]. Paper K).
- 19 Sec 37 — and —. Pragmatic approach in the design of a depth classification schedule. Case study. (Lib sc. 2; 1965; Paper C).
- 20 Sec 35 — and —. Productive methods in the design 561 of depth schedules. (DRTC Seminar (3) (1965). [Papers and proceedings]. Paper C).
- 21 Sec 35 — and —. Zero increases hospitality. (DRTC 424 Seminar (3) (1965). [Papers and proceedings]. Paper D).
- 22 Sec 36 —, —, and DENTON (P H). Motor vehicle production engineering: Depth classification: Demonstration. (Lib sc. 4; 1967; Paper H).
- 23 Sec 35 —. —. (—, Sec 6). 424 561
- 24 Sec 343 —. —. (—, Sec 8).

- 25 Sec 37 PARTHASARATHY (V V). Combination of quasi isolates. (DRTC Seminar (3) (1965). [Papers and Proceedings]. Paper E).
- 26 Sec 37 RAGHAVENDRA (M K). Refinement technique in the design of depth classification schedule. (DRTC Seminar (3) (1965). [Papers and proceedings]. Paper F).
- 27 Sec 212 RANGANATHAN (S R). Conflict in classification for document retrieval. (Lib sc. 2; 1965; Paper K).
- 28 Sec 211 —. Depth classification, tools for retrieval, and organisation for search. (*In* Ranganathan (S R). *Ed.* Documentation and its facets. 1963. Chap P2).
- 29 Sec 35 —. Descriptive account of Colon Classification. 1967. US ed. 1965. Chap A).
- 30 Sec 53 —. —. (— Chap V).
- 31 Sec 211 —. —. (— Chap X).
- 32 Sec 61 —. —. (— Sec ZS2).
- 33 Sec 35 —. Design of depth classification: Methodology
561, (Lib sc. 1; 1964; Paper A).
422
- 34 Sec 424 —. —. (—, Sec 4).
- 35 Sec 54 —. —. (—, Sec 52).
- 36 Sec 73 —. Dialectics of the UDC. (Abgila. 2; 1952; P 203-14).
- 37 Sec 343 —. Freely faceted classification and depth classification. (DRTC Seminar (4) (1966). [Papers and proceedings]. Paper G).
- 38 Sec 31 —. Five laws of library science. 1931.
- 39 Sec 415 —. General and special classification. (*In* Atherton (P), *Ed.* Classification research. 1965. P 81-93).
- 40 Sec 55 —. Hidden roots of classification. (Lib sc. 4; 1967; Paper A, Sec 8).
- 41 Sec 01 —. Library classification through a century. (*In* Atherton (P), *Ed.* Classification research. 1965. P 15-35). (Lib. sc. 2; 1965; 1-30).
- 42 Sec 4 —. Optional facets in library classification (9). (Annals, Ind Lib Assoc. 2; 1951-52; 175-78).
- 43 Sec 35 —. Prolegomena to library classification. 1937.

- 44 Sec 424 —. —. Ed 2. 1957. Sec 362.
45 Sec 32 —. —. Ed 3. 1967. Chap BB to BD.
46 Sec 55 —. —. Chap BC and BD.
47 Sec 57 —. —. Chap KC.
48 Sec 33 —. —. Chap RA.
49 Sec 413 —. —. Chap SB.
50 Sec 52 —. —. Part L and Chap SE and SF.
51 Sec 52 —. —. Part P.
52 Sec 14 —. —. Sec QA7.
53 Sec 14 —. —. Sec QA71.
54 Sec 413 —. Subject heading and facet analysis. (J doc. 20: 1964; 109-19).
55 Sec 416 —. Three crises in documentation. (FID Congress (33) (Tokyo) (1967).
56 Sec 422 —. W Universe: Portion, constituent, organ. (Annals, Ind Lib Assoc. 3; 1953; 1-6).
57 Sec 37 VASUDEVA RAO (K N). Chemical rocket engine production: Depth classification. (DRTC Seminar (4) (1966). [Papers and proceedings]. (Paper Q. Sec 5).