



Ranganathan, Shiyali Ramamrita.
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PART Q

CLASSIFICATION AS TRANSFORMATION

CHAPTER QA

PARAMETER AND DIMENSION

1 Parameter

In Mathematics, the term 'Parameter' means an arbitrary constant, each particular value of which characterises some particular member of a system of functions, curves, or surfaces. In the classification of a Universe of Isolate Ideas, each of the successive characteristics used in arriving at an isolate idea are, therefore, sometimes referred to as the 'Parameter' of its classification. Similarly, in an Enumerative Classification each of the successive characteristics used in arriving at a subject is also a 'Parameter' in this sense.

2 Dimension

In Mathematics, the term 'Dimension' means the degree of manifoldness of an aggregate as fixed by the number of parameters necessary and sufficient to identify anyone of its members—that is, to distinguish it from all the others. Thus, a line—straight or curved—has only one dimension, since its points (members) are identified by the values of a single parameter. Similarly, a surface—plane or curved—has two dimensions, since we need two parameters to identify a point (member) on it. The physical space surrounding us has three dimensions. Let us apply this concept to Classification. Some examples are given in the first four of the succeeding sections.

3 Geographical Isolates

Let us take the Universe of Geographical Isolates. Let us first confine ourselves to the continents only. The "World" is the Original Universe. To derive the continents we use one and only one characteristic. Therefore, the Universe of Continents may be said to be of one dimension.

Let us take the countries (with sovereign status) in all the continents. To derive them from the Original Universe "World", we use two characteristics. Therefore, the Universe of Countries may be said to be of two dimensions.

Similarly, the Universe of Constituent States of all the countries of the World may be said to be of three dimensions.

Again, the Universe of Districts (Counties) may be said to be of four dimensions.

This can be continued indefinitely so as to give a Universe of Isolate Ideas of five dimensions, six dimensions, and so on.

Viewed from this angle, the Universe of Geographical Isolate Ideas is said to be multi-dimensional.

4 Agricultural Plants

Let us take the Universe of Agricultural Plants. It has been found convenient to derive a specific plant from the Universe of Agricultural Plants, with the use of the three successive characteristics—Utility, Part of the plant dominantly in use, and a Cultivable Plant. Viewed from this angle, the Universe of Agricultural Plants is of three dimensions. But each plant can be sub-divided further into strains—that is, cultivars. Viewed from the angle of cultivars, the Universe of Agricultural Plants is of four dimensions. And so on.

5 Literary Works

Let us take the Universe of Literary Works. It has been found convenient to derive a specific literary work from the Universe of Literary Works with the use of the four successive characteristics—language, form, author, and work. Viewed from this angle, the Universe of Literary Works is of four dimensions. The Universe of Authors of all forms of literary work in all languages may be taken to be of three dimensions. So also the Universe of Literary Forms in all languages may be said to be of two dimensions. Again, the Universe of Literary Works in all languages may be said to be of one dimension.

Here, four sub-universes are involved—the universe of languages, the universe of literary forms, the universe of authors, and the universe of the works of the authors.

51 SUB-UNIVERSE OF LANGUAGES

The Sub-Universe of Languages is itself multi-dimensional. For example, it has been found convenient to derive the languages such as, "English" from the sub-universe of languages through Indo-Aryan languages and Teutonic languages. Thus, "English" is a member of a sub-sub-universe of three dimensions, within the sub-universe of languages. So also Teutonic Languages is a sub-sub-universe of two dimensions, within the sub-universe of languages. So also the Indo-Aryan languages form a sub-sub-universe of one dimension within the sub-universe of languages.

6 Homonym

In the above sections QA5 and QA51, the term 'Dimension' is used in different senses. In other words, it is made a homonym. This will lead to difficulties. This difficulty is avoided by the convention mentioned in the two succeeding sections.

7 'Dimension' in Enumerative Classification

71 NUMBER OF DIMENSIONS OF A SUBJECT

In an Enumerative Classification, the number of dimensions of a subject is the number of characteristics used in arriving at it.

72 NUMBER OF DIMENSIONS OF A UNIVERSE OF SUBJECTS

In an Enumerative Classification, the number of dimensions of the Universe of Subjects is the number of dimensions of the subject having the largest number of dimensions.

8 'Dimension' in Faceted Classification**81 BASIC SUBJECT****811. DIMENSION OF A BASIC SUBJECT**

The number of dimensions of a Main Subject is one. The number of dimensions of a Basic Subject is one more than the number of steps of division used in deriving it from its Main Subject. For example, the dimension of the Main Subject Mathematics is one and the dimension of the Basic Subject Determinant is three.

812 DIMENSION OF UNIVERSE OF BASIC SUBJECTS

The number of dimensions of the Universe of Basic Subjects is the number of dimensions of the Basic Subject having the largest number of dimensions.

82 ISOLATE IDEA**821 DIMENSION OF AN ISOLATE IDEA**

The number of dimensions of an isolate idea is the number of characteristics used in arriving at it.

822 DIMENSIONS OF THE UNIVERSE OF ISOLATE IDEAS

The number of dimensions of the Universe of Isolate Ideas is the number of dimensions of the Isolate Idea having the largest number of dimensions.

83 COMPOUND SUBJECT**831 FACET-DIMENSION OF A COMPOUND SUBJECT**

The number of Facet-Dimensions of a Compound Subject is the number of its facets.

832 FACET-DIMENSION OF THE UNIVERSE OF COMPOUND SUBJECTS

The number of Facet-Dimensions of the Universe of Compound Subjects is the number of Facet-Dimensions of the Compound Subject having the largest number of Facet-Dimensions.

833 NUMBER OF DIMENSIONS OF A COMPOUND SUBJECT

The number of dimensions of a Compound Subject is the sum of the number of dimensions of each of its facets.

834 NUMBER OF DIMENSIONS OF THE UNIVERSE OF COMPOUND SUBJECTS

The number of dimensions of the Universe of Compound Subjects is the number of dimensions of the Compound Subject having the largest number of dimensions.

84 COMPLEX SUBJECT

841 PHASE-DIMENSION OF A COMPLEX SUBJECT

The number of Phase-Dimensions of a Complex Subject is the number of its phases.

842 PHASE-DIMENSION OF THE UNIVERSE OF COMPLEX SUBJECTS

The number of Phase-Dimensions of the Universe of Complex Subjects is the number of Phase-Dimensions of the Complex Subject having the largest number of Phase-Dimensions.

843 FACET-DIMENSIONS OF A COMPLEX SUBJECT

The number of Facet-Dimensions of a Complex Subject is the sum of the number of facets of each of its phases *plus* one less than the number of its phases.

The Phase Relation between each pair of consecutive phases is also counted, as if it were a Facet-Dimension.

844 FACET-DIMENSIONS OF THE UNIVERSE OF COMPLEX SUBJECTS

The number of Facet-Dimensions of a Universe of Complex Subjects is the number of Facet-Dimensions of the Complex Subject having the largest number of Facet-Dimension.

845 NUMBER OF DIMENSION OF A COMPLEX SUBJECT

The number of dimensions of a Complex Subject is the sum of the number of dimensions of each of its phases *plus* one less than the number of the phases.

846 NUMBER OF DIMENSIONS OF THE UNIVERSE OF COMPLEX SUBJECTS

The number of dimensions of the Universe of Complex Subjects is the number of dimensions of the Complex Subject having the largest number of dimensions.

85 PHASED ISOLATE IDEA

851 NUMBER OF DIMENSIONS OF A PHASED ISOLATE IDEA

The number of dimensions of a Phased Isolate Idea is the sum of the number of characteristics used in arriving at its Component Isolate Ideas *plus* one less than the number of its Component Isolate Ideas.

In determining the number of dimensions of isolate ideas, of Compound Subjects, and of Complex Subjects, the number of dimensions of the phased isolate, if any, should also be included.

86 DIMENSIONS OF THE UNIVERSE OF SUBJECTS

The number of dimensions of the Universe of Subjects, all taken together, is the number of dimensions of the Compound or Complex subject, as the case may be, having the largest number of dimensions.

87 FACET-DIMENSION OF THE CHAIN OF A COMPOUND SUBJECT

The following turn of expression may be of help. In a Compound Subject, the Basic Subject Chain and the several Isolate Idea Chains may be said to fall in different Facet-Dimensions.

Analogy:—

Consider the chain satisfying the following conditions:

- 1 Its top end is attached to a nail to the south-end of a beam;
- 2 The chain is then taken along the beam to its north-end;
- 3 The chain is then taken down the pillar to its bottom;
- 4 The chain is then taken from the bottom of the pillar in the

eastern direction.

This Chain may be said to lie in three dimensions.

A Basic Subject has its chain lying in only one Facet-Dimension.

A Compound Subject with one isolate idea has its chain lying in two Facet-Dimensions.

A Compound Subject with two isolate ideas has its chain lying in three Facet-Dimensions; and so on.



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CHAPTER QB

ANALOGY OF TRANSFORMATION AND MAPPING

1 Physical Limitation

In arranging books on the shelves of a library, convenience requires that they should be arranged along a line. Even when we apparently arrange them on six or seven shelves in a bay of a book-rack, it is really equivalent to arranging them in one line. We may call it a broken line, if necessary. If this is realised, arrangement of books, on the shelves in the several bays of several book-racks put in several lines in tier after tier, can also be seen to be arrangement in a line. This linear arrangement of books is an unavoidable physical necessity, shall we say, at the present stage of evolution of humanity! Probably, in most of us thinking also is linear.

2 Arrangement of Subjects

In a linear arrangement of books, books sharing the same ultimate subject will come together. We can mentally represent that set of books by a single entity—the common subject of books. Then the arrangement of the books can be replaced by the arrangement of the sets of books each set sharing the same subject. Thus, the subjects themselves have to be arranged along a line. The physical limitation enforcing linear arrangement of books enforces also linear arrangement of subjects.

3 Mathematical View of Classification

Let us remember that subjects belong to a multi-dimensional universe. They are found arranged in the measure of their mutual relations in that multi-dimensional universe. It is difficult even for the mind to see, in all its details, that quality of their arrangement. In the library they have to be arranged along a line. Viewed in Mathematical Abstraction, Classification of Subjects for arrangement in a library amounts to transforming the system of points marked out in multi-dimensional space into a system of points along a line. There is another way of stating it. The multi-dimensional space should be mapped along a one-dimensional space—that is, a line.

4. Number of Mappings Possible

It is a matter of experience in Mathematics that mapping a space of a number of dimensions on one of a smaller number can be done in several ways. What distinguishes one way from another is the property of the first space that is kept "invariant" in the second space.

5 Invariant in Classification

To examine what is kept "invariant" in the Classification of Subjects, we should remember that in the Original Universe the different subjects have Immediate-Neighbourhood-Relation of various removes from any chosen subject. The Immediate-Neighbourhood-Relation of several of the subjects can have the same remove because of the multi-dimensional nature of the space in which subjects lie. In Classification, the Canon of Decreasing Extension should be followed. For definiteness, let us consider only those subjects that are all having smaller extension than that of the chosen Basic Subject, and also have with it Immediate-Neighbourhood-Relation of the first remove. In the linear arrangement, only one of those subjects can have Immediate-Neighbourhood-Relation of the first remove with the chosen Basic Subject. All the other subjects having Immediate-Neighbourhood-Relation of the first remove in the multi-dimensional universe will have to lose that status in the linear arrangement. In other words, only one of the subjects can have its Immediate-Neighbourhood-Relation kept *Invariant* in the Mapping.

6 Complexity of the Problem

The study of the Invariant, in the Mapping outlined above, is complicated. To get a feel of it, we shall consider a few simple cases in the next two chapters.

7 Apupa Arrangement

Let us look at the whole problem of transformation and mapping from the angle of the reader. The focal point of his interest at the moment will be a particular subject. But we must remember that his interest will not be exhausted by that focal point. It will spread out from there in different directions in different dimensions. Pulling out the subject-complex needed by him will be like pulling out grass by the roots. Though the stem looks unitary, the root has several ramifications and comes out of different depths in different directions in a scattered area. The reader would really like to have the subject forming his focal point, and also certain other subjects with different degrees of Immediate-Neighbourhood-Relation with it. Let us now consider a linear arrangement of the subjects of different degrees of interest to him at the moment. Let us call the focal point of his main interest his Umbral Region. He would like to have fanned out on either side of the Umbral Region the subjects having successfully a decreasing bearing on the Umbral Subject. The two regions—on either side of the Umbral Region—may be called his Penumbra Regions; and the subjects in them Penumbra Subjects. The Penumbra Regions will ultimately

thin out into the Alien Regions on either side. As he glances from one end to the other of his total Region, the reader will pass successively through the Alien, the Penumbral, the Umbral, and again the Penumbral and the Alien Subjects. This is Apupa Arrangement. It is such an Apupa Arrangement that will give that reader the greatest satisfaction at the moment in full conformity to all the Five Laws of Library Science (See Chap DB).

71 LIMITATION OF MAPPING

We have seen that the mapping involved in the linear arrangement of subjects can keep *Invariant* only certain Immediate-Neighbourhood-Relations of different Removes. Thus, the Apupa Arrangement with one subject as the Umbral Subject may not agree with one having another subject as the Umbral Subject. Hence, Everywhere-Apupa-Arrangement is not practicable. In other words, what is Apupa Arrangement for one reader will militate against the Apupa Arrangement for a reader with some other Umbral Subject of interest. Moreover, the same difficulty will arise even with one and the same reader as and when his Umbral Subject of interest changes.

72 COMPROMISE ARRANGEMENT

In the circumstances, a compromise Apupa pattern has to be adopted so as to be of the greatest help to the greatest number of people on the greatest number of occasions. The method of arriving at such a compromise Apupa Arrangement is examined in Part R.

73 SAFEGUARDING THE MINORITY INTEREST

The above-mentioned compromise on Apupa Arrangement is bound to prove less helpful to a minority of readers. The Laws of Library Science are exacting in their democracy. They would not allow even a minority of one to suffer. At the same time, to go on changing the scheme for classification to suit the interest of every minority would lead to the predicament of the old man, his son, and his ass made well-known by a fable of Aesop. A method of avoiding the Scylla and the Charybdis is described in Chap WB and WC.

CHAPTER QC

MAPPING THE UNIVERSE OF PROFESSORS FOR ONE CHARACTERISTIC

0 Symbols

For illustration, we shall use the Universe of Professors mentioned in Sec EN2, EN3, and EN5. For brevity of use in the diagram, we shall use the following symbols.

Symbol	Universe of
P	Professors
P _b	Brilliant Professors
P _C	Professors in Chemistry
P _d	Dull Professors
P _l	Professors in English Literature
P _l	Professors in Law
P _m	Mediocre Professors
P _R	Professors in Religion
P _Z	Professors in Zoology
P/C/b	Brilliant Professors in Chemistry
P/C/d	Dull Professors in Chemistry
P/C/m	Mediocre Professors in Chemistry and so on.

1 Mapping for Rhetorical Ability

11. DIAGRAM

For the diagram, see Fig 19 in the last page of this chapter.

12. DESCRIPTION

Each of the universes of brilliant, dull, and mediocre professors respectively has Immediate-Neighbourhood-Relation with the universe of professors (P). This is indicated in the diagram by making P the Centre of an arc on which P_b, P_d, and P_m lie. Let us take the horizontal radius of the circle shown in the diagram, as the line on which these Universes are to be mapped. Let us assume that in the mapping,

1 The universe of brilliant professors (P_b) should have its Immediate-Neighbourhood-Relation with the universe of professors (P) be kept Invariant;

2 The universe of mediocre professors (P_m) should have Neighbourhood-Relation of Remove 2 with the universe of professors (P); and

3 The universe of dull professors (P_d) should have Neighbour-

hood-Relation of Remove 3 with the universe of professors (P). Then the mapping of the four universes will be as shown in the diagram. Of course, the universe of professors (P) should occupy the first place; and so it does. It is obvious that by changing the assumptions in all possible ways we can have six alternatives for mapping. The problem is to choose one of these six, on the basis of some relevant principle, as helpful to the purpose of the majority of readers.

2 Mapping for Subject

21 DIAGRAM

For the diagram, see Fig 20 in the last page of this chapter.

22 DESCRIPTION

The universes of the professors in Chemistry (P_C), English Literature (P_E), Law (P_L), Religion (P_R), and Zoology (P_Z) respectively have Immediate-Neighbourhood-Relation with the universe of professors (P). This is indicated in the diagram by making P the centre of the arc on which P_C , P_E , P_L , P_R , and P_Z lie. Let us take the horizontal radius of the circle shown in the diagram, as the line on which these universes are to be mapped.

Let us assume that in the mapping

1 The universe of professors in Chemistry (P_C) should have its Immediate-Neighbourhood-Relation with the universe of professors (P) kept Invariant;

2 The universe of professors in Zoology (P_Z) should be given Neighbourhood-Relation of Remove 2 with the universe of professors (P);

3 The universe of professors in English Literature (P_E) should be given Neighbourhood-Relation of Remove 3 with the universe of professors (P);

4 The universe of professors in Religion (P_R) should be given Neighbourhood-Relation of Remove 4 with the universe of professors (P); and

5 The universe of professors in Law (P_L) should be given Neighbourhood-Relation of Remove 5 with the universe of Professors (P). Then the mapping of the six universes will be as shown in the diagram. Of course, the universe of professors (P) should occupy the first place; and it does. It is obvious that by changing the assumptions in all possible ways we can have 120 alternative ways of mapping. The problem is to choose one of these 120, on the basis of some relevant principles, as helpful to the purpose of the majority of readers.

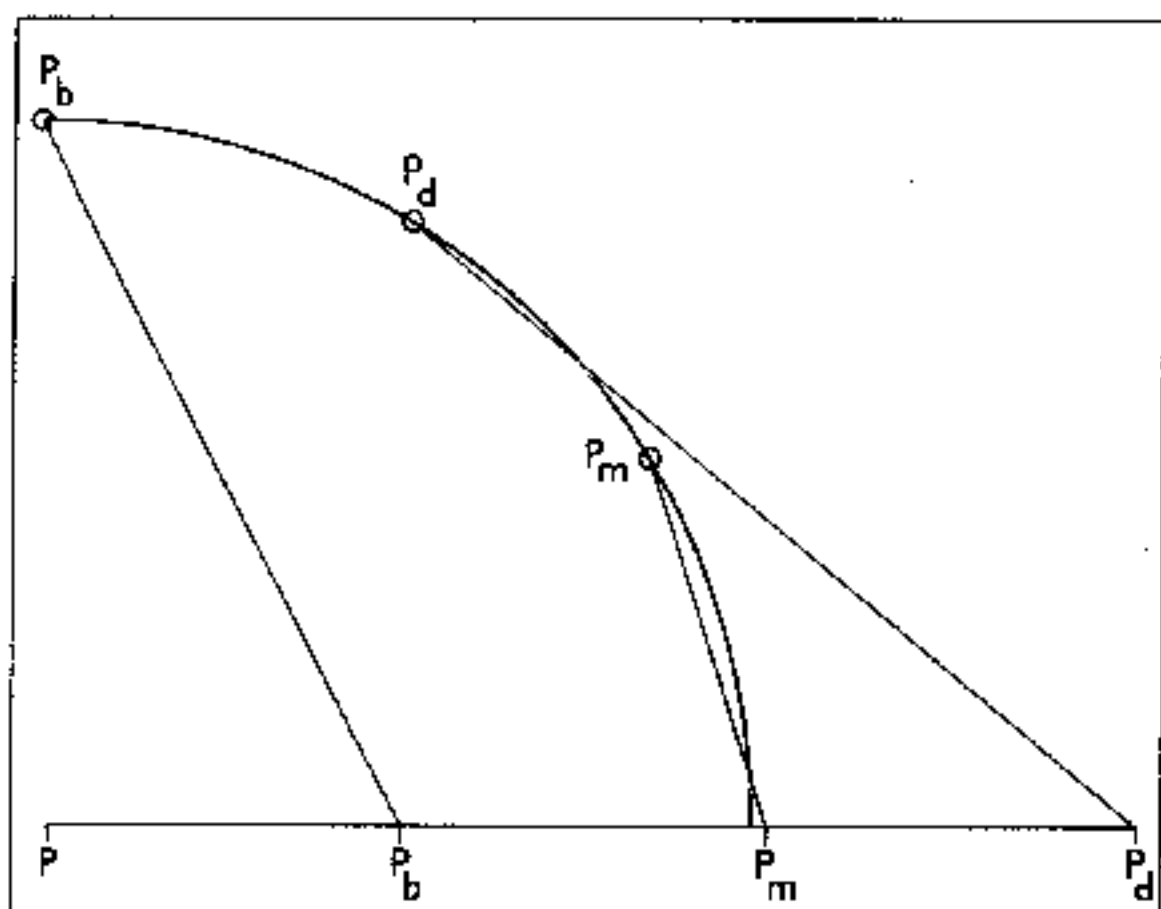


FIG. 19

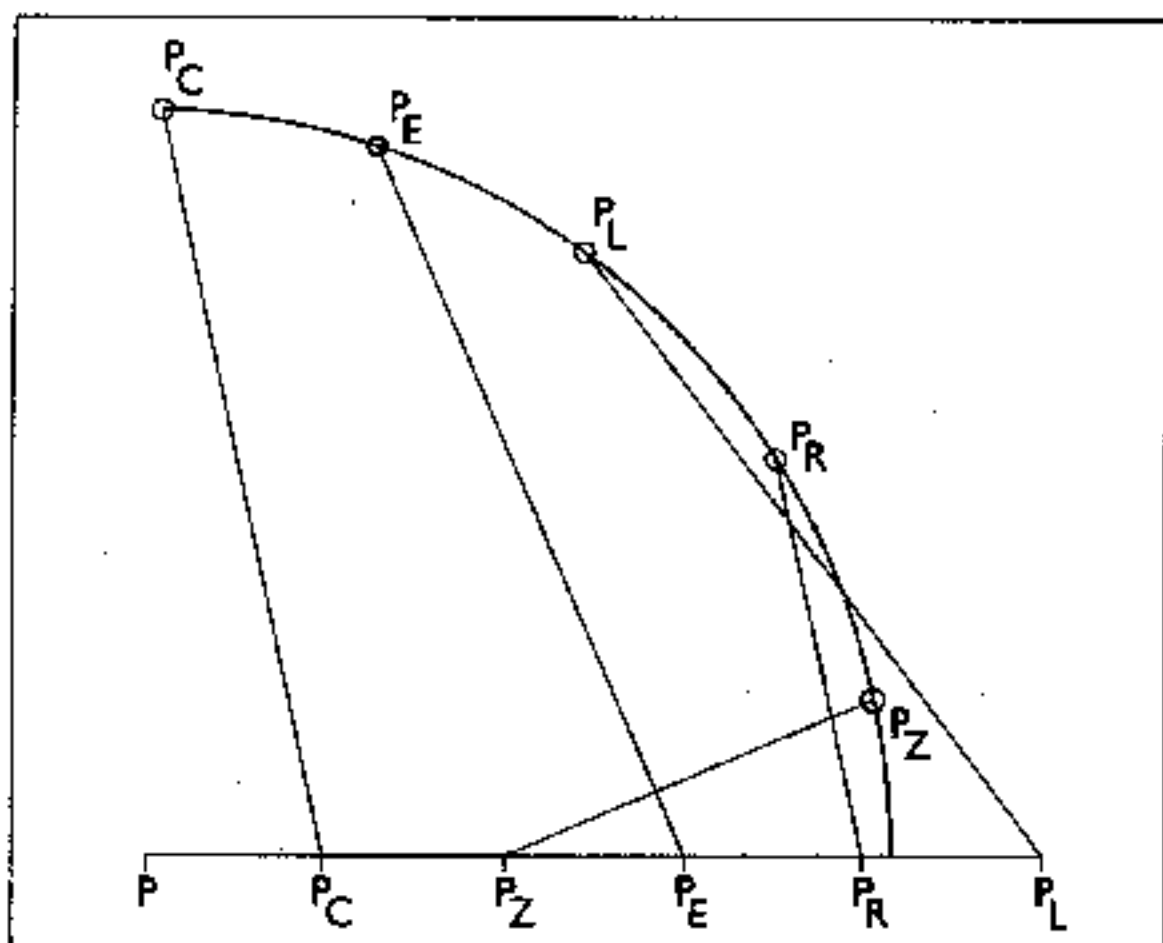


FIG. 20

CHAPTER QD

MAPPING THE UNIVERSE OF PROFESSORS FOR TWO CHARACTERISTICS

0 Abbreviations

The abbreviations given in Sec QB0 will hold good for this chapter also.

1 Diagram

For the diagram, see Fig 21 in the last page of this Chapter. To avoid overcrowding in the diagram only three subjects, Chemistry, Religion, and Law, are represented.

2 Process of Mapping

When the number of characteristics is two, the mapping of the universes formed on the basis of both the characteristics will not be as simple as for one characteristic. The mapping will have to be done in several stages.

3 Assumptions

1 The totality of the divisions of Universe of Professors (P) based on subject characteristic (taken as the unit) should have its Immediate-Neighbourhood-Relation with it kept invariant; and

2 The totality of the divisions of Universe of Professors based on Rhetorical Ability characteristic (taken as a unit) should be given Neighbourhood-Relation of Remove 2.

4 Seven Stages in Mapping

Then the mapping should be done in seven stages as follows :

1-5 For each of the five divisions based on Subject Characteristic, do the mapping for the characteristic Rhetorical Ability in the way shown in Chap QB. This is shown in Fig 21 in the last page of this Chapter by the small arcs with centres C, E, L, R, and Z and their respective short radii.

6 Map the five short radii along the long radius, as shown in the diagram.

7 Map the divisions b, m, and d based on Rhetorical Ability as characteristic, along the long radius, as shown in the diagram. Now the mapping of the Universe of Professors for two characteristics has been completed.

5 Alternatives for Mapping

Alternatives for Mapping can be had in different ways as shown below :

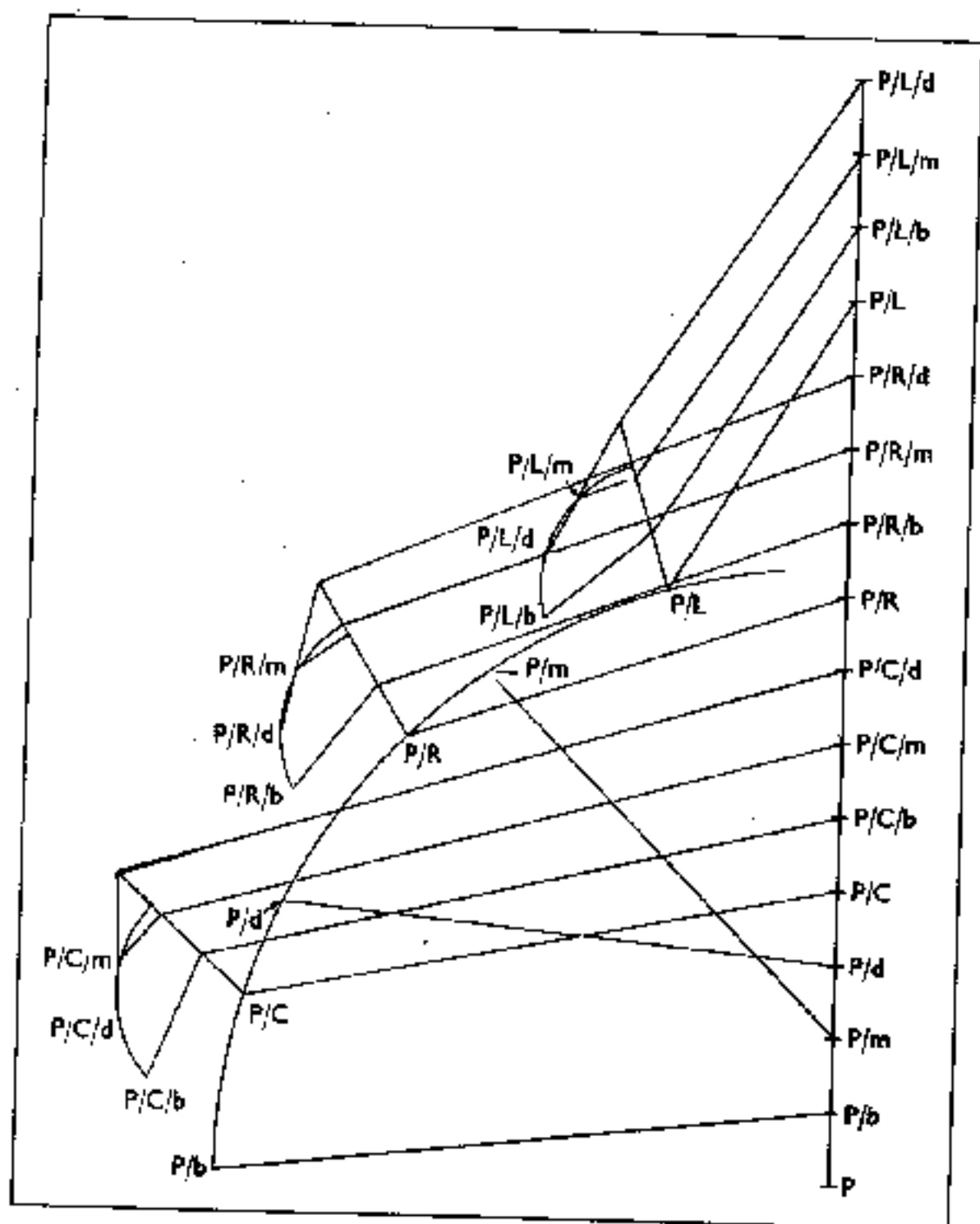


FIG. 21

CHAPTER QE

MAPPING THE UNIVERSE OF SUBJECTS

1 Mapping of a Basic Subject or an Isolate Idea

The mappings described in Chap QC and QD give an analogy to the mapping of Compound Subjects of different Order going with a Basic Subject.

2 Mapping of Compound Subjects going with One Basic Subject

The mapping of the Compound Subjects going with one Basic Subject has to begin with the mapping of the Isolate Ideas in each facet likely to occur in one or other of the compound subjects. Thereafter, a further stage of mapping has to be done for the facets themselves. This stage of mapping will admit of several alternatives for mapping even as the mapping of the Universe of Professors for several characteristics. The schematic diagram for the mapping of the Compound Subjects going with a single Basic Subject will be more complicated than the one for the Universe of Professors, or the Universe of Basic Subjects, or the Universe of Isolate Ideas, taken severally. The total number of alternatives for mapping will further increase multiplicatively.

3 Mapping of All the Compound Subjects

To get the number of alternatives for mapping all the Compound Subjects, going with all of the respective Basic Subjects, will involve an initial mapping of the Basic Subjects themselves on the line. Then, it can be seen that the total number of alternatives for mapping will increase multiplicatively once again.

4 Mapping All Subjects—Compound and Complex

Proceeding along the same lines it can be seen that the number of alternatives for mapping all the compound and complex subjects—that is, the entire Universe of Subjects—will still further increase multiplicatively.

5 Minimising the Torture

One way to minimise the torture of making so many decisions is discussed in Chap RA.



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