Chain Procedure and Structuring of a Subject.
(Cataloguing problems. 18).

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[The theoretical foundation of the Chain Procedure is discussed. Its intimate relationship with the postulates about the structures of names-of-subject is shown. The application of these postulates for semantic *cum* syntactic analysis of names-of-subject is demonstrated. The problems of subject headings are enumerated. The term ' Chain Procedure ' is defined. The variables that contribute to the development of the different versions of the Chain Procedure are distinguished. The different versions of the Chain Procedure are illustrated. The contributions on the Chain Procedure since 1934 are reviewed to show the different stages of its development.]

1 Theoretical Foundation of Chain Procedure

11 CONCEPT OF " CHAIN "

The concept of " Chain " in the context of the Universe of Subjects, is the foundation of the Chain Procedure. A Chain is deemed to be a structural manifestation of a subject. The term ' Structure ' in this context refers to the parts constituting a subject and their mutual interrelationship.

12 STRUCTURE OF SUBJECT

A subject *qua* subject is an abstract entity; for, it is not amenable to observation and manipulation in the way in which a concrete entity is. Naturally, it is difficult to recognise any intrinsic natural structure of an abstract entity like a subject.

13 STRUCTURE OF NAME-OF-SUBJECT

A treatment on a subject can be heard or observed. Such a treatment consists of an organised or systematised body of ideas expressed in a natural language. This body of ideas can be named indicatively by a descriptive statement in a natural language. It is possible to recognise the structure of such a name-of-subject. The structure of a name-of-subject recognised by one, may differ from that recognised by another, depending upon the psychological outlook of the persons expounding or

using its informational contents. Again in natural language, the
same structure can be expressed in different alternative descrip-
tive statements. This is partly due to the flexibility in the rules
of the grammar of the natural language concerned; and partly
due to the presence of synonyms. For the purpose of organising
subjects, the facts that the structure of a subject is not determina-
ble, and that the structure of a name-of-subject is determinable,
make it imperative to deem the term 'Structure of Name-of-
Subject' as the substitute for the term 'Structure-of-Subject.'

14   ROLE OF CLASSIFICATION TO USERS OF INFORMATION
        The cognitive activities — that is, remembering and recalling
information, thinking, problem solving, and creating — of the
users of information essentially call for the classification of sub-
jects. The term 'Classification' in this context, refers to the
results as well as to the process of laying bare the principal features
or structure of a subject partly to make it definite, to delimit it
from other subjects, and partly to make possible a systematic
exploration of it. Of course, the classification of a universe is
impracticable without determining the structure of the entities
comprised by it. While it is not practicable to determine the
structure of a subject *qua* subject; it is quite practicable to deter-
mine the structure of a name-of-subject. In other words, names
of-subject are amenable to classification. For this reason, naming
of subjects by descriptive statements in natural language is a
well established practice among the creators and users of infor-
mation. Alternative names for one and the same subject are
not infrequent.

15   ROLE OF CLASSIFICATION IN PROMOTING USE OF INFORMATION
        Promotion of the use of information calls for the identi-
fication, analysis, organisation, transmission (dissemination),
storage and retrieval of information. Each of these, in turn,
calls for the determination of the structure of names-of-subject
for the purpose of their classification. To facilitate the use of
information, "Classification" in this context has to aim at
"grouping" by "arranging" the names-of-subject. Naming
of subjects in natural language which admits of alternatives
cannot serve this purpose effectively. Thus arises the need for
the standardisation of the naming practice.

16   POSTULATION FOR STANDARDISATION OF STRUCTURE
161   *Structure in the Verbal Plane*
        The need for "grouping" by "arranging" calls for
the elimination of the use of auxiliary words, as far as practi-
cable, in naming subjects; this is the first step towards standardi-

sation. Due to this the natural language syntax of the descriptive statements gets disturbed. To make up for the loss, it becomes necessary to prescribe a rigid sequence of the ideas denoted by the substantive terms in the names-of-subject. This sequence has to ensure helpfulness to the constructors and the users of these names. For this reason, it becomes necessary to categorise the ideas denoted by the different substantive terms. A substantive term may have synonyms and near-synonyms. It becomes necessary to standardise the use of substantive terms. As a result of this whole process of standardisation, emerges an artificial language which uses the terms of a natural language. Naturally, the grammar of such a language consists of a set of Postulates, predominently about the structure of names-of-subject. A postulate is a proposition preferred for its helpfulness to the purpose: the epithets " true " or " false " do not directly apply to a postulate. A reference tool designed to ensure uniformity in the use of such an artificial language of terms may be called a Scheme for Verbal Classification. It can take the form of a " Thesaurus " or of a " Subject Authority List."

162 *Structure in the Notational Plane*
The names-of-subject in an artificial language using the terms of a natural language can be " translated " into an artificial language of ordinal numbers called " Notation ". The notational system can be so designed according to an additional set of postulates, that the names-of-subject in notational language arranged in the increasing sequence of their respective ordinal values would ensure an APUPA pattern (Alien, Penumbral, Umbral, Penumbral, Alien) at any point of the arrangement. A reference tool designed to ensure uniformity in the use of such an artificial language of ordinal numbers may be called a Scheme for Notational Classification. Evidently, a scheme for notational classification (popularly known as a scheme for classification) is a version of a scheme for verbal classification.

17 FUNDAMENTAL ROLE OF POSTULATES
Obviously, the foundation of the design of a scheme for verbal classification or of a scheme for notational classification has to be a throughly worked out set of postulates predominen,y about the structure of names-of-subject. Every existing scheme, both for verbal and notational classification, has its own set of postu'ates as its foundation. In the majority of cases, the set of postulates is impliedly included within the design of the scheme. In a few cases, it is explicitly stated. For example, the Colon Classification is based on the General Theory of Library Classification which consists of a set of postulates about

the structure of names-of-subject. When the postulates are not explicitly stated inconsistency becomes inevitable in the design work. Lack of thoroughness, integration, and comprehensiveness in the formulation of such a set of postulates affects its rigour and runs counter to the principle of helpfulness.

18 UNIFORMISATION OF STRUCTURE
        It has already been pointed out in Sec 13 and Sec 14 that names-of-subject in natural language formulated by users of information vary within a range. This variation in the verbal plane may be largely due to variation in the recognition of structure in the idea plane. Nevertheless, it is possible to identify a structure of a name-of-subject corresponding to the systematic way of thinking of a normal person and in this region the variation is expected to be least. All structural variations can be uniformised in this structure. This structure reveals a trans-verbal Absolute Syntax (26, 39). Based on this finding, it has been possible to develop a general theory about the structure of names-of-subject. This theory can be helpfully utilised fo designing any scheme for classification — verbal or notational.

2 Postulates and Chain
21 FOUNDATION OF CHAIN
        An integrally related set of postulates intended to implement the postulate of absolute syntax does not rule out the possibility of other alternative sets of postulates claimed to be logical and helpful for the purpose of promoting the use of information. In practice, they do exist and will continue to exist. In the background of the above analysis, it is now possible to look at the relationship between a set of postulates about the structure of names-of-subject and a Chain.
        The concept of Chain becomes operative only after the concept of a set of postulates about the structure of names-of-subject is conceded. It has already been noted earlier that such a set of postulates is the basis for designing a scheme for verbal classification and also for a scheme for notational classification.

22 RANGANATHAN'S POSTULATES
        Any such set of postulates about the structure of names-of-subject can be examined to concede the concept of Chain. Only a few explicitly stated sets are available. Among them the set of postulates enunciated by S R Ranganathan (38, 40) as the foundation of the General Theory of Library Classification is adequately developed from the points of view of thoroughness, integration, and comprehensiveness. It would be helpful to

examine them for the purpose of understanding the relationship between them and the concept of Chain. An interpretative version of some of his fundamental ideas is furnished in the following sections to reveal their intimate relationship.

23 GENERAL POSTULATES

The following are some of the general postulates about the structure of the universe of subjects:

1 *Subject* .— A subject manifests itself as an organised or systematised body of ideas, whose extension and intension are likely to fall coherently within the field of interest and comfortably within the intellectual competence and the field of inev.-table specialisation of a normal person.

2 *Elementary Constituents* .— A manifestation of a Subject can be referred to in terms of the following elementary constituents: Basic Subject, Isolate Idea, and Speciator. In other words, an elementary constituent term of a name-of-subject is either a term denoting a Basic Subject, or a term denoting an Isolate Idea, or a term denoting a Speciator.

3 *Isolate Idea* .— An Isolate Idea is an idea or idea-complex fit to form a component of a subject, but not by itself fit to be deemed to be a subject.

4 *Basic Subject* .— A Basic Subject is a subject without any Isolate Idea as a component.

5 *Speciator* .— A Speciator is an idea or idea-complex used or intended to be used as a qualifier going with a host Basic Subject or a host Isolate Idea.

51 *Source of Speciator* .— A recognised Isolate Idea or a subject may become the source of a Speciator going with another host Isolate Idea or a host Subject.

52 *Special Component* .— An idea which is not by itself an Isolate Idea or a Subject, but can be used as a Speciator going with a host Isolate Idea or its subdivisions, is a Special Component.

24 POSTULATES RELATING TO SIMPLE SUBJECT

The following are some of the postulates relating to the structure of the universe of Simple Subjects. Wherever warranted, " Notes " on Chain are given

1 *Simple Subject* .— A Simple Subject consists of a Basic Subject alone.

2 *Variety of Basic Subject* .— A Basic Subject is either a Main Basic Subject or a Non-Main Basic Subject.

3 *Main Basic Subject* .— There is no means of defining a Main Basic Subject; and therefore, it is postulated. A Main Basic Subject is deemed to be a subject belonging to the array of

order 1 of the universe of subjects. It neither comprehends any other Main Basic Subject; nor is it comprehended by any other Main Basic Subject. The presumption is that no Main Basic Subject can be expressed in terms of the other Main Basic Subjects. The array of the Main Basic Subjects is a discontinuous open array — that is, it admits of extrapolation and interpolation. This array includes (1) the traditional pure disciplines — such as, Mathematics, Physics, and Chemistry; (2) the applications of the traditional pure disciplines — such as, Engineering, Chemical Technology and Agriculture; (3) comparatively new pure disciplines " distilled " from practice-in-action — such as, Systemology, Cybernetics, and Management Science; and (4) disciplines emerging due to fusion of two or more existing disciplines — such as, Biomechanics, Biophysics, and Biochemistry. The array of the Main Basic Subjects may be deemed to have been derived from the universe of subjects on the basis of the characteristic " By distinct disciplines. "

NOTE ON MAIN BASIC SUBJECT AND CHAIN

The structure of the universe of subjects as recognised by the above mentioned postulates, may be summarised as follows: The universe of subjects, on the basis of the characteristic " By Distinct disciplines " gets divided into Main Basic Subjects. This phenomenon may be schematically represented as follows:

UNIVERSE OF SUBJECTS

MATHEMATICS   PHYSICS   CHEMISTRY
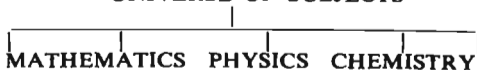
The relationship between the universe of subjects and a Main Basic Subject, say Physics, can be separately represented as follows:

UNIVERSE OF SUBJECTS

UNIVERSE OF SUBJECTS > PHYSICS

Note .— The symbol '>' represents that the entity immediately following it is an immediate subdivision of the entity preceding it.

This is the schematic representation of the Chain to which the Main Basic Subject " Physics " belongs. In relation to the Main Basic Subject " Physics " the status of " Universe of Subjects " is that of the Original Universe; for, the latter, in this context, belongs to the array of order 0, and the former belongs to the array of order 1. " Universe of Subjects " is again the Immediate Universe of " Physics "; for, the order of the former is immediately earlier to that of the latter. The Immediate. Universe

of a given subject is also called its Universe of Remove 1; and
the Immediate Universe of the Universe of Remove 1 is its
Universe of Remove 2 and so on.

A chain is a sequence of subjects made up of any
given subject and its Universe of Remove 1, Remove 2,
Remove 3, etc carried backwards to any point desired. Any
subject in a Chain is a Link. The order of a Link is equal
to the order of the subject forming it. The Link of the lowest
order contained in a Chain is its First Link. The Link of the
highest order contained in a Chain is its Last Link. The order
of a Chain is equal to the order of its First Link. A Chain of
order 0 is a Primary Chain (40).

It is evident from the above analysis that the postulates
about the structure of the universe of subjects form the founda-
tion of the concept of Chain. The " Notes " on Chain given
in connection with the different kinds of subject will confirm
the proposition fully.

4 *Non-Main Basic Subject* .— A Non-Main Basic Subject
is either a Canonical Basic Subject, or a Compound Basic Sub-
ject.

5 *Canonical Basic Subject* .— A traditional subdivision of
a Main Basic Subject, not necessarily derived on the basis of a
definitely ascertainable characteristic, is a Canonical Basic Subject.

Note .—   The basis of deriving a Canonical Basic Subject,·
even if it is a definitely ascertainable characteristic, does not
warrant a Speciator to go with the Main Basic Subject from
which it is derived, for the specification of the Canonical Basic
Subject concerned.

Example :   The following are the Canonical Basic Subjects
derived from the Main Basic Subject " Physics ":   Fundamentals
of Physics, Properties of Matter, Sound, Heat, Thermodynamics,
Light, Electronics, Electricity, Magnetism, and Transport Pheno-
mena.

NOTE ON COMPOUND BASIC SUBJECT AND CHAIN

The derivation of the subject " Properties of Matter ' from
the subject " Physics "   can be   schematically   represented as
follows :

PHYSICS
↓
PHYSICS > PROPERTIES OF MATTER

This is the schematic representation of the Chain to which the
subject " Properties of Matter " and " Physics " belong. The
Chain ends backward with the subject " Physics ";   it is the uni-
verse of Remove 1 in relation to the subject " Properties of
Matter." The Main Basic Subject " Physics " belongs to the

array of order 1 in relation to the Original Universe " Univeres of Subjects." Therefore, " Physics " by itself is not the Original Universe; it is merely the First Link of the Chain concerned.

6 *Simple Basic Subject* .— A Simple Basic Subject consists either of a Main Basic Subject alone, or of a Canonical Basic Subject alone.

7 *Compound Basic Subject.* — A Compound Basic Subject is a Basic Subject with one or more Speciators.

Note .— 1 A Compound Basic Subject with a single Speciator is an immediate subdivision of a Main Basic Subject or of a Canonical Basic Subject; and the Speciator is derived on the basis of any one of the following characteristics: " By Specials," " By Environment," and " By System."

2 A Compound Basic Subject with two or more Speciators is an immediate subdivision of another Compound Basic Subject; and the Speciators are derived on the basis of any two or all of the following characteristics: " By Specials," " By Environment," and " By System."

8 *Sequence of Speciators* .— The Speciators of a Compound Basic Subject occur in the decreasing sequence of their respective capacity of mutual comprehension.

When arranged in the decreasing sequence of their respective capacity of mutual comprehension, the Speciators of a Compound Basic Subject fall in the following sequence: System, Environment, Specials.

Example:

1 Compound Basic Subjects with a System Speciator: Physics — Quantum theory; Medicine — Ayurveda; Education — Montessori school.

2 Compound Basic Subject with an Environment Speciator: Physics — Low temperature; Medicine — Industrial; Economics — War.

3 Compound Basic Subjects with a Specials — Speciator: Physics — Nuclear; Medicine — Child; Economics — Small scale.
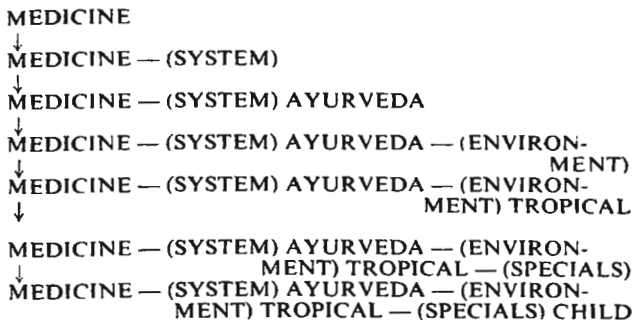
4 Compound Basic Subjects with two or more Speciators: Medicine — Ayurveda — Child; Medicine — Ayurveda — Tropical — Child.

NOTE ON COMPOUND BASIC SUBJECT AND CHAIN

For all practical purposes, we may say that the " Extension " of a subject has for its measure the number of entities, or the range comprised in he subject; while its " Intension " has for its measure the number of characteristics used in deriving the subject from the original universe. On the basis of the postulates mentioned above, it is possible to specify the extension of

the Main Basic Subject " Physics " in terms of all the Simple Basic Subjects derived canonically from it, and all the Compound Basic Subjects that can be derived from it and from its canonical divisions on the basis of the characteristics " By Specials," " By Environment," and " By Systems." used singly and in all possible combinations. This implies that a set of divisions derived canonically or on the basis of any one of the characteristics mentioned above, is a " subset " of " Physics." In these circumstances, the partial comprehensions — such as, " Specials of Physics," " Environmented Divisions of Physics " and " Systems of Physics " may be deemed as different immediate sub-divisions of " Physics." An individual member of any one of these partial comprehensions may be deemed to be one of its subdivisions. It may be noted that the terms — such as " Specials," " Environment " and " Systems " simultaneously denote the partial comprehensions and the characteristics on the basis of which the individual members are derived from the Main Basic Subject. Such a situation calls for the use of the term denoting a characteristic as the name of a partial comprehension. In the consideration of a Chain it becomes necessary to consider the partial comprehensions if they are involved.

In the context of the above discussion, consider the derivation of the Compound Basic Subject " Medicine — Ayurveda — Tropical — Child." The derivation can be schematically presented as follows:

MEDICINE
↓
MEDICINE — (SYSTEM)
↓
MEDICINE — (SYSTEM) AYURVEDA
↓
MEDICINE — (SYSTEM) AYURVEDA — (ENVIRON-
↓   MENT)
MEDICINE — (SYSTEM) AYURVEDA — (ENVIRON-
↓   MENT) TROPICAL

MEDICINE — (SYSTEM) AYURVEDA — (ENVIRON-
↓   MENT) TROPICAL — (SPECIALS)
MEDICINE — (SYSTEM) AYURVEDA — (ENVIRON-
                MENT) TROPICAL — (SPECIALS) CHILD

Note .— The symbol ' — ' represents that the entity immediately following it is a speciator to the totality of the entities preceding it. A characteristic used as a partial comprehension is put in parentheses.

This is the schematic presentation of the Chain to which the Compound Basic Subject " Medicine — Ayurveda — Tropical — Child " belongs as the Last Link.

It is convenient to present vertically the sequence of the subjects forming a Chain. Putting the arrow is merely a means to make the suggestion of Chain visible to the eye. It can be presented without the arrows also. Similarly, it can be presented horizontally, and that also without arrows as follows:

MEDICINE
MEDICINE — (SYSTEM)
MEDICINE — (SYSTEM) — AYURVEDA · MEDICINE —
         (SYSTEM) AYURVEDA — (ENVIRONMENT)
MEDICINE — (SYSTEM) AYURVEDA — (ENVIRON-
                       MENT) TROPICAL
MEDICINE — (SYSTEM) AYURVEDA — (ENVIRON-
                      MENT) TROPICAL (SPECIALS)
MEDICINE — (SYSTEM)   AYURVEDA — (ENVIRON-
            MENT).   TROPICAL — (SPECIALS) CHILD

A chain should comprise a link of every order that lies between the orders of the First Link and the Last Link of the Chain. The main idea behind any kind of presentation is that each link of the chain should be readily ascertainable from the presentation. This idea can be implemented even in more simpler presentation both vertically and horizontally. For example, the vertical presentation of the above Chain can take the following form:

MEDICINE

(SYSTEM)
↓
AYURVEDA
↓
(ENVIRONMENT)
↓
TROPICAL
↓
(SPECIALS)
↓
CHILD

In this form, each Link is represented by its " characteristic " component alone. Each of the omitted components of each link is readily ascertainable with reference to its Upper Links, if there is any. The horizontal presentation of the Chain can be sim-

plified by using the Last Link as the representative of the whole Chain as follows:

MEDICINE — (SYSTEM) AYURVEDA — (ENVIRON-MENT) TROPICAL — (SPECIALS) CHILD.

Each of the Links comprised by the Chain is readily ascertainable from this presentation. For this reason, only this kind of pre-sentation of the Last Link of a Chain is taken to be representative of the whole Chain to which it is the Last Link.

25 POSTULATES RELATING TO ISOLATE IDEAS

The following are some of the postulates relating to the structure of the universe of Isolate Ideas. Whenever warranted, " Notes " on chain are given.

1 *Fundamental Categories* .— An Isolate Idea is a mani-festation of any one of the following five, and only five Funda-mental Categories : Personality (= P), Matter (= M), Energy (= E), Space (= S), and Time (= T).

2 *Time* .— Ideas, such as millenium, century, decade, year, day, night, summer, winter, dry period, stormy period, are the manifestations of the Fundamental Category " time."

3 *Space* .— The surface of the earth, the space inside it, and the space outside it, are the manifestations of the Funda-mental Category " Space."

4 *Energy* .— An action *qua* action of one kind or another is a manifestation of the Fundamental Category " Energy." The action may be among and by all kinds of entity — inanimate, animate, conceptual, intellectual, and intuitive.

5 *Matter* .— The manifestations of the Fundamental Category " Matter " are taken to be of three kinds: Method, Property, and Material.

6 *Matter (Method)* .— Ideas, such as way, means, mode, manner, fashion, system, skill, technique, process, procedure, rules, design, and plan of or for performing an action are the manifestations of " Matter (Method) " (= MM).

7 *Matter (Property)* .— Ideas such as, quality, triat, attri-bute, characteristic, and distinguishing feature of an entity are the manifestations of " Matter (Property) " (= MP).

Note .— Iinvestigation has shown that an idea deno-ting a " Method " may be the primary focus of study going with a Basic Subject. In that case, it is to be deemed to be a manifestation of the Fundamental Category " Personality." An idea denoting a " Method " may, in some cases, be deemed to be a Speciator to a Property Isolate. In the majority of cases, an idea denoting a " Method " occurs in association with an Energy Isolate. In such a case, it is helpful to deem it to be a Speciator to the Energy Isolate concerned (27). In this

circumstance, the manifestations of the Fundamental Category " Matter " are taken to be of two kinds: Property and Material.

8   *Matter* (*Material*) .— Ideas, such as elements, or constituents, or substance, or basic matter of something physical are the manifestations of " Matter (Material) " (= MMt).

9   *Simple Isolate Idea* .— An Isolate Idea without any Speciator as its component is a Simple Isolate Idea.

Note .— 1   A Simple Isolate Idea may be the source of origin of another Simple Isolate Idea.

2   When the characteristic on the basis of which the subdivisions of a Simple Isolate Idea are derived, does not warrant a Speciator for the specification of each of the subdivisions, then each of the resulting subdivisions also is a Simple Isolate Idea.

3   In such a case, the application of the successive characteristics of the scheme of characteristics result in an array of different order. The scheme of characteristics consists of the same characteristic to be applied to the Isolate Ideas of successive orders. For example, the scheme may consist of characteristics — such as, " By Kinds of different orders," "By Organs of different orders," " By Taxonomic Categories of different orders" and " By Geographical Divisions (Portions) of different orders."

Example

Note .— The enumeration of Isolate Ideas is in different arrays is left incomplete in many cases, as it is not necessary for the purpose of the examples.

FOOTWEAR

By Kinds of different orders
Shoe
   Boot
   Blucher
   Jodhpur
   Oxford
   Balmoral
   Brogue
   Gillic
   Moccasin

HUMAN BODY

By Organs of different orders
Cell
Tissue
Regional Organs
System-organs
Digestive system
   Mouth
   Mouth cavity
   Palate
    Uvula
Other organs

Animal Kingdom
By Taxonomic Categories of different orders
Protozoa ⎱
Metazoa ⎰   Sub-kingdom
  Mesozoa ⎫
  Parazoa ⎬   Branch
  Eumetazoa ⎭

World
By Geographical Divisions of different-orders
Asia — Continent
  India — Country
   Mysore — State
America — Continent

Radiata ⎱   Grade   United States — Country
Bilateria ⎰   New York — State
Protostomio — Division
Acoelometa
Pseudoecoelomata ⎱   Sub-division
Eucoclomata. ⎰
Denterostomia — Division

10 *Compound Isolate Idea* .— An Isolate Idea with one
or more Speciators as its components is a Compound Isolate
Idea.

Note .— A Simple Isolate Idea is the source of origin of a
Compound Isolate Idea with a single Speciator.

2   When the characteristic, on the basis of which the sub-
divisions of a Simple Isolate Idea are derived, warrants a Speciator
for the specification of each of the sub-divisions, then each of
the sub-divisions is a Compound Isolate Idea.

3   In such a case, the application of each of the successive
characteristics of the scheme of characteristics to the principal
Simple Isolate Idea results in a Coalesced Array of Compound
Isolate Ideas each having a single Speciator. The scheme of
characteristics consists of different characteristics. They also
admit of being applied in succession for the derivation of Com-
pound Isolate Ideas belonging to the arrays of successive orders.

Example

Footwear   Human Body

By Material   *By Age*
Footwear — Wooden   Human body — Embryo
Footwear — Leather   Human body — Child
Footwear — Feather   Human body — Adolescent
Footwear — Rubber   Human body — Adult
Footwear — Plastic   Human body — old
Footwear — Paper
Footwear — Porolux   *By Sex*
Footwear — Felt   Human body — Male
Footwear — Cloth   Human body — Female
Footwear — Sponge   Human body — Eunuch
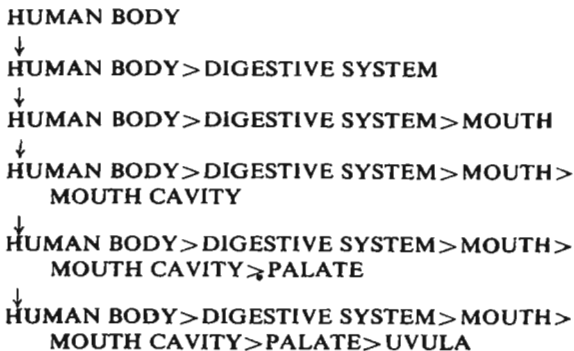Footwear — Metal

11 *Sequence of Speciators* .— Depending upon the context,
the Speciators of a Compound Isolate Idea generally occur in
the sequence suggested by the Wall-Picture Principle: If two
entities (Speciators) A and B are such that the concept behind B
will not be operative unless the concept behind A is conceded,
even as a mural picture is not possible unless the wall exists to
draw upon, then Entity (Speciator) A should precede Entity
(Speciator) B.

Note .— 1 When the Wall-Picture Principle cannot be applied directly to a pair of characteristics to determine their sequence, it may be possible to apply it through Group-Strategy. Group-Strategy consists of (1) dividing the whole set of characteristics into a few groups on the basis of certain principles of grouping; (2) applying the Wall-Picture Principle to the groups pair by pair to determine a helpful sequence among them; and (3) applying the Wall-Picture Principle to the characteristics in each group pair by pair to arrive at a helpful sequence among them.

2 In certain situations, It may be convenient to correlate the groups of characteristics, or individual characteristics with the Fundamental Categories P, M, E, S, and T; and to arrange them in the decreasing sequence of concreteness of the Fundamental Categories to which they are correlated. When arranged in the decreasing sequence of concreteness the five Fundamental Categories fall in the following sequence: PMEST.

NOTE ON ISOLATE IDEAS AND CHAIN

1 On the basis of the postulates mentioned above, the derivation of the Simple Isolate Idea " Uvula " from the Simple Isolate Idea " Human Body " can be schematically represented as follows:

HUMAN BODY
↓
HUMAN BODY>DIGESTIVE SYSTEM
↓
HUMAN BODY>DIGESTIVE SYSTEM>MOUTH
↓
HUMAN BODY>DIGESTIVE SYSTEM>MOUTH>
   MOUTH CAVITY
↓
HUMAN BODY>DIGESTIVE SYSTEM>MOUTH>
   MOUTH CAVITY>PALATE
↓
HUMAN BODY>DIGESTIVE SYSTEM>MOUTH>
   MOUTH CAVITY>PALATE>UVULA

This is the schematic representation of the Chain in which the Isolate Idea " Uvula " is the Last Link. In the above Chain, each of the Isolate Ideas forming Link 2 to Link 6 is a " Non-Whole " (Organ) of the Isolate Idea preceding it, when the latter

is considered as an individual entity. The Chain admits of the simplified vertical presentation as follows:

HUMAN BODY
↓
DIGESTIVE SYSTEM
↓
MOUTH
↓
MOUTH CAVITY
↓
PALATE
↓
UVULA

It may be presented horizontally as follows:
HUMAN BODY>DIGESTIVE SYSTEM>MOUTH>
MOUTH CAVITY>PALATE > UVULA
This is also the Last Link of the Chain.

2 On the basis of the postulates mentioned above, the derivation of the Compound Isolate Idea " Human Body — Female — Child " from the Simple Isolate Idea " Human Body " can be schematically represented as follows:

HUMAN BODY
↓
HUMAN BODY — FEMALE
↓
HUMAN BODY — FEMALE — CHILD

The simplified version of its horizontal presentation would take the following form:
HUMAN BODY — FEMALE — CHILD

26 POSTULATES RELATING TO COMPOUND SUBJECTS

1 *Compound Subject* .— A subject with a Basic Subject and one or more Isolate Ideas as components is a Compound Subject.

2 *Facet* .— A facet is either a Basic Facet or an Isolate Facet of a Compound Subject.

3 *Basic Facet* .— The Basic Subject Component of a Compound Subject is a Basic Facet.

4 *Isolate Facet* .— Any Isolate Idea Component of a Compound Subject is an Isolate Facet.

5 *Occurrence of Basic Facet* .— Every Compound Subject has a Basic Facet.

6 *Occurrence of Isolate Facets* .— Every Compound Subject has one or more Isolate Facets.

7 *Isolate Facets and Fundamental Categories.* — Each Isolate Facet of a Compound Subject is deemed to be a manifestation of one and only one of the Five Fundamental Categories — *viz* P, M, E, S and T.

8 *Compound Subject without Round* .— A Compound Subject without any manifestation of the Fundamental Category " Energy " is a Compound Subject without Round.

9 *Compound Subject without Round and Level* .—A Compound Subject without Round having a single manifestation of one or more of the Fundamental Categories " Personality," " Matter " " Space " and " Time " is a Compound Subject without Round and Level.

10 *Compound Subject with Level* .— A Compound Subject without Round having two or more manifestations of any one of the Fundamental Categories " Personality, " " Matter, " " Space," and " Time " is a Compound Subject with Level.

Note .— The first manifestation of the Fundamental Category " Personality," in a Compound Subject with Level, is said to be Level 1 Personality Facet ; its second manifestation in that subject is said to be Level 2 Personality Facet and so on. So also is the case with " Matter," " Space " and " Time ".

11 *Compound Subject with Round* .— A Compound Subject with a manifestation of the Fundamental Category " Energy " is a Compound Subject with Round.

Note — 1 The Fundamental Category " Energy " may manifest itself in one and the same Compound Subject more than once. The first manifestation of " Energy " is taken to end Round 1 of the manifestations of the three Fundamental Categories " Personality," " Matter " and " Energy." The second manifestation of " Energy is taken to end Round 2 of the manifestations of the three Fundamental Categories " Personality," " Matter "; and " Energy "; and so on.

2 The manifestations of the Fundamental Category " Energy " in Round 1, Round 2, etc of a Compound Subject are Round 1 Energy Facet, Round 2 Energy Facet, etc respectively.

3 Each of the Fundamental Categories " Personality " and " Matter " may manifest itself in Round 1, Round 2, and so on.

4 The manifestations of the Fundamental Category " Personality " in Round 1, Round 2, etc are Round 1 Personality Facet, Round 2 Personality Facet, etc respectively.

5 The manifestations of the Fundamental Category " Matter " in Round 1, Round 2, etc are Round 1 Matter Facet, Round 2 Matter Facet, etc.

6 Ordinarily, any of the Fundamental Categories " Space,"

and " Time " may manifest itself only in the last of the Rounds in a Compound Subject with Round.

12 *Compound Subject with Round and Level* —. A Compound Subject with Round having two or more manifestations of any one of the Fundamental Categories " Personality," " Matter," " Space," and " Time " in a Round is a Compound Subject with Round and Level.

NOTE ON LEVEL

1 Any of the Fundamental Categories " Personality " and " Matter " may manifest itself more than once in one and the same Round within a Compound Subject with Round and so also the Fundamental Categories " Space " and " Time " in the Last Round of a Compound Subject with Round.

2 The first manifestation of the Fundamental Category " Personality " in a Round within a Compound Subject with Round and Level is said to be its Level 1 Personality Facet: its second manifestation in that Round is said to be its Level 2 Personality Facet, and so on. So also is the case with " Matter," " Space " and " Time."

3 The successive manifestations of the Fundamental Category " Personality " in Round 1 within a Compound Subject with Round and Level, are Round 1 Level 1 Personality Facet, Round 1 and Level 2 Personality Facet, etc. The cases of the successive manifestations of the Fundamental Category " Personality " in Round 2, Round 3, etc are analogous to that in Round 1. The cases of the successive manifestations of the Fundamental Category " Matter " in Round 1, Round 2, etc are analogous to that of the Fundamental Category " Personality."

4 The successive manifestations of the Fundamental Category " Space " in the Last Round are simply Level 1 Space Facet, Level 2 Space Facet, etc, So also is the case with the Fundamental Category ''Time ".

5 The Fundamental Category " Energy " can occur only once within a Round.

13 *Position of Basic Facet* .— In a Compound Subject the Basic Facet should be the first facet.

14 *Principle of Concreteness* .— When arranged according to their decreasing concreteness, the Five Fundamental Categories fall into the following sequence: P M E S T.

15 *Sequence of Isolate Facets in a Compound Subject without Round* .— In a Compound Subject without Round — that is, in which no manifestation of the Fundamental Category " Energy " occurs — the Isolate Facets should be arranged in the decreasing sequence of the concreteness of the Fundamental Categories of which they are respectively the manifestations.

16 *Sequence of Isolate Facets in a Compound Subject with Round* .— In a Compound Subject with Round — that is, in which a manifestation of the Fundamental Category "Energy" occurs — the Isolate Facets in each Round should be arranged in the decreasing sequence of the concreteness of the Fundamental Categories of which they are respectively the manifestations.

17 *Sequence of Facets of Different Levels.*— Facets of different Levels of the same Fundamental Category in each Round of a Compound Subject should be kept together arranged in the increasing sequence of their respective Levels.

18 *Determination of Round and Level* .— The Round and the Level of the manifestation of a Fundamental Category in a Compound Subject is to be ascertained on the basis of its position in the sequence of the Facets determined by applying the following principles:

1 Wall-Picture Principle .— If in a Compound Subject, Facet A and Facet B are such that the concept behind Facet B will not be operative unless the concept behind Facet A is conceded, even as a mural picture is not possible unless the wall exists to draw upon, then Facet A should precede Facet B.

2 Whole-Organ Principle .— If in a Compound Subject, Facet B is an organ of Facet A, then Facet A should precede Facet B.

3 Cow-calf Principle .— If in a Compound Subject, Facet A and Facet B are such that they are not to be separated though they are distinct from each other and thus separable, Facet A and Facet B should be kept together in the same Round, even as a milch cow and its unweaned calf are not separately sold out though they are distinct entities and thus separable, but are kept together in possession of the same owner.

4 Actand-Action-Actor-Tool Principle .— If in a Compound Subject, Facet B denotes an action on Facet A by Facet C with Facet D as the too, then the four Facets should be arranged in the following sequence: A, B, C, D.

NOTE ON COMPOUND SUBJECT CHAIN

1 The postulates mentioned above, imply that the systematic analysis of a name-of-subject is to be based on a fully expressive name-of-subject in terms of all the necessary and sufficient elementary constituents. At the level of a document, its title may serve as a starting point, for, filling of a document is a process of naming in natural language the subject treated in it. But, there is hardly any standard practice of titling. For this reason, it becomes necessary to enrich or augment the title by examining the information contained in the document from the points-of-view of Facets prescribed by the postulates — that is

by using the set of postulates, as if it were a "check-list.". According to this procedure, anything less than what is mentioned in the following name-of-subject in natural language would fall short of the requirement of serving as the basis for syntactic analysis of the specific subject concerned:

 In medicine, treatment by chemical therapy of the tuberculosis (disease caused by *Mycobacterium Tuberculosis*) of lungs of adolescent girls in India in 1930's.

 2 In the above name-of-subject, the elementary constituents — that is, Basic Subject and Isolate Ideas with their respective Speciators, if any — can be recognised according to the pertinent postulates as follows:

 1 Basic Subject

 11 Main Basic Subject: Medicine

 12 Speciators to the Main Basic Subject: Female, and Adolesecnt.

 13 Therefore, the Compound Basic Subject: Medicine — (Specials) Female — Adolescent

 2 Personality Isolate Idea: Lungs.

 3 Matter (Property) Isolate Idea

 31 Principal Matter (Property) Isolate Idea: Disease.

 32 Speciators to the Principal Matter (Property) Isolate Idea: Tuberculosis.

 33 Therefore, the Compound Matter (Property) Isolate Idea: Disease — Tuberculosis.

 4 Energy Isolate Idea

 41 Principal Energy Isolate Idea: Treatment.

 42 Speciator to the Principal Energy Isolate Idea: Chemical Therapy.

 43 Therefore, the Compound Energy Isolate Idea: Treatment-Chemical Therapy.

 5 Space Isolate Idea: India

 6 Time Isolate Idea: 1930's.

 3 On the basis of the above analysis, it is now possible to determine separately the different Chains to which the Basic Subject and the different Isolate Ideas belong. For the sake of economy let them be presented only horizontally as follows:

 1 Chain for the Basic Subject: Medicine — (Specials) Female — Adolescent.

 2 Chain for the Personality Isolate Idea: Human body > Respiratory system > Lungs.

 3 Chain for the Matter (Property) Isolate Idea: Disease — Tuberculosis.

 4 Chain for the Energy Isolate Idea: Treatment — Chemical Therapy.

 5 Chain for the Space Isolate Idea: World > Asia > India.

6 Chain for the Time Isolate Idea: 1,000 (Millennium)> 1900 (Century),>1930's (Decade).

4 On the basis of the Postulates for Sequence, the different Chains can now be combined to determine the Chain for the Compound Subject concerned as follows:

     MEDICINE — (SPECIALS)   FEMALE — ADOLESCENT
        , HUMAN   BODY > RESPIRATORY   SYSTEM >
        LUNGS
        ; DISEASE — TUBERCULOSIS
        : TREATMENT — CHEMICAL THERAPY
        . WORLD >- ASIA > INDIA
        ' 1000 >- 1900 >- 1930's

Note.—Each of the punctuation marks indicates that the elementary constituent following it is as follows :

   — indicates a Speciator
   > indicates a Direct Array Division —— that is, a non-whole of the elementary constituent preceding it.
    , indicates a Personality Facet
    ; indicates a Matter Facet
    : indicates an Energy Facet
    . indicates a Space Facet
    ' indicates a Time Facet

27   POSTULATES RELATING TO COMPLEX SUBJECT

    1   *Complex Subject.*—A subject formed by compiling two subjects expounding or on the basis, of some relation between them is a Complex Subject.

2   *Phase.*—Each component-subject of a Complex Subject is a Phase.

3   *Kinds of Phase-Relation.*—The following kinds of Phase Relation are recognised:

        0   General Relation
        1   Bias Relation
        2   Comparison Relation
      21   Difference Relation
        3   Application Relation
        4   Influence Relation

4   *General Relation.*—In the case of General Relation, the exposition does not admit of being recognised to be centering round merely any one of the relations listed above. Each of the Phases may be called a General Phase.

5   *Bias Relation.*—In the case of Bias Relation, the exposition of one Phase is specially either by selection, or arrangement of topics, or emphasis, or standard, or examples, or other means to the needs of a specialist in the subject forming the other phase.

The former may be called a Biased Phase, and the latter a Biasing Phase.

6 *Comparison Relation.*—In the case of Comparison Relation, one phase is Compared with the other Phase. Each of the Phases may be called a Comparison Phase.

7 *Difference Relation.*—In the case of Difference Relation, one Phase is compared with the other Phase to expound primarily the difference between them. Each of the Phases may be called a Difference Phase. Evidently, Difference Relation is a specific manifestation of Comparison Relation.

8 *Application Relation.*—In the case of Application Relation, one Phase is used as a tool-subject to expound the subject forming the other Phase. The former may be called an Applied-to Phase; and the latter a Tool Phase.

91 *Influence Relation.*—In the case of Influence Relation, the impact or effect or influence of one Phase on the other Phase is expounded. The former may be called an Influencing Phase, and the latter an Influenced Phase.

NOTE ON PHASE RELATION

1   Latest investigation has shown that it is helpful to deem a case of Comparison Relation to be a case of " Evaluation from a Point-of-View " —— specific or general. So also is the case of difference Relation: for, it is a specific manifestation of Comparison Relation.

2   Latest investigation has also shown that a case recognised to be a case of Application Relation between two Main Basic Subjects at a particular point of time, ultimately gives rise to a Fused Main Subject. It has been found helpful to deem a Fused Main Subject as an " Adjune " to the Main Basic Subject forming the primary subject expounded. It has been said that in a Fused Main Subject, the two Main Basic Subjects are fused together in such a way that each of them looses its individuality in respect of the schedules of Isolate Ideas needed to form the Compound Subjects going with it. Further investigation has shown that the criterion mentioned above need not be regarded as the essential characteristic. For it is very difficult to demonstrate and establish this characteristic convincingly. Secondly, while the above criterion recognises the application of one Main Basic Subject to another as a case of Fused Main Subject, it fails to recognise the application of the same expounding Main Basic Subject to a Non-Main Basic Subject or a Compound Subject going with the same expounded Main Basic Subject, as a sub-division of the Fused Main Subject concerned. This decision runs counter to the principle of " Grouping by Arranging " in the context of the recognition of the Main Basic Subjects and Non-

Main Basic Subjects. It has now been found helpful to deem
a Fused Main Subject amenable to further division into Non-Main
Basic Subjects either canonically or on the basis of the recognised
characteristics, if warranted; and to allow the Isolate Ideas going
with the expounded Main Basic Subject to go, if warranted,
with the Fused Main Subject to form Compound Subjects. A
Fused Main Subject formed on the basis of Application Relation
between two Main Basic Subjects may be found to be readily
amenable to division into Non-Main Basic Subjects analogously
with the expounding Main Basic Subject. This latest line of
thinking provides solution to the problems of apparent " Fusion"
between any two subjects — of the same kind or of different
kinds. Further, research in this regard is in progress.

92 *Sequence of Phases*.—The sequence of the phases in the
cases of the different kinds of Phase Relation, will be as follows:

1 In the case of General Relation, the Phase which is the
primary subject of expression, or is otherwise deemed to be primary,
followed by the other Phase. So also is the case with Comparison
Relation and Difference Relation.

2 In the case of Bias Relation, the Biasing Phase followed
by the Biased Phase. (*Note*.—Previously, the prescription was
Biased Phase followed by Biasing Phase).

3 In the case of Application Relation, the Applied-to Phase,
followed by the Tool-Phase.

4 In the case of Influence Relation, the Influenced Phase
followed by the Influencing Phase.

NOTE ON COMPLEX SUBJECT AND CHAIN

1 It is evident from the above postulates that a Phase
may be either a Basic Subject (Simple Subject), or a Compound
Subject. The Chains for each of these have been demonstrated
separately in the earlier sections. In the case of a Complex
Subject, the Chain is a combination of the Chains for both its
Phases. For example, consider the following names-of-subject:

1 Labour economics for social workers; and
2 Influence of Buddhism on Christianity.

3 Example 1 is a case of Bias Relation, and Example 2
is a case of Influence Relation. On the basis of the above postu-
lates, the Phases of these Complex Subjects can be recognised
as follows:

11 Biasing Phase: Social Work
12 Biased Phase: Labour in Industrial Economics
21 Influenced Phase: In Religion, Christianity
22 Influencing Phase: In Religion, Buddhism.

3 On the basis of the above analysis it is now possible to
determine separately the different Chains to which the different

Phases belong. For the sake of economy, let them be presented only horizontally as follows:

11 Chain for the Biasing Phase: Social Work
(*Note*.—The Original Universe " Universe of Subject " need no more be considered in the context of syntactic analysis of subjects).

12 Chain for the Biased Phase: Industrial Economics, Labour.
21 Chain for the Influenced Phase: Religion, Christianity.
22 Chain for the Influencing Phase: Religion, Buddhism.

4 On the basis of the Postulates for sequence, the different Chains can now be combined to determine the Chain for each of the Complex Subjects as follows:

1 SOCIAL WORK *biasing* INDUSTRIAL ECONOMICS, LABOUR

2 RELIGION, CHRISTIANITY *influenced by* RELIGION, BUDDHISM.

3 APPLICATION OF POSTULATES FOR SEMSYNTACTIC ANALYSIS OF NAMES-OF-SUBJECT

31 HINTS ABOUT THE DESIGN OF SCHEMES FOR CLASSIFICATION
It will be evident from the discussion in Sec 2, that the design of a Scheme for Classification — verbal or notational —— is to be based on the " semantic *cum* syntactic " (= Semsyntactic) analysis of names-of-subject. The semsyntactic analysis of names-of-subject is again based on a set of postulates about the structures of names-of-subjects; and it results in the determination of the Chains to which the various subjects belong. Viewed from this angle, any subject is a Link in a Chain; and any Link is suggestive of the Chain to which it belongs. The demonstration of the formation of Chains given in Sec 2, taken along with the above findings implies that the concept of " Chain " is severely relative; there is hardly anything absolute about it. For, it is entirely dependent on the

1 Relevant characteristics allowed; and
2 Sequence of the application of these characteristics.

These two factors may vary with the set of postulates forming the foundation of the structure of names-of-subject. This variation becomes solely responsible for the variation in effectiveness of the result got by applying the postulates.

311 *Steps involved in Semsyntactic Analysis*
The application of the postulates for designing a Scheme for Classification — verbal or notational — results in semsyntactic analysis of names-of-subject. This semsyntactic analysis generally involves the following Steps:

Step 1. Naming of the specific subject coextensively in natural language in terms of the postulated elementary constituents of

names-of-subject (= Coextensive Name-of-Subject);

Step 2. Representation of the Coextensive Name-of-Subject in kernal terms, each denoting an elementary constituent, by excluding the auxiliary terms in it (= Kernel Name-of-Subject);

Step 3. Categorisation of each elementary constituent according to a set of pertinent postulates (= Analysed Name-of-Subject);

Step 4. Transformation of the Analysed Name-of-Subject by earranging, if necessary, the elementary constituents according to a set of pertinent postulates (= Transformed Name-of-Subject);

Step 5. Determination of the Chain to which each elementary constituent is the Last Link when considered separately at its own level (= Unit-Chain Analysis); and

Step 6. Standardisation of each term used in denoting a Link in each unit-chain (= Standardization of Terms).

Note.—These steps are illustrated in each " Note on Chain " in Sec 2.

The methodology of designing a Scheme-for-Classification involves several additional steps; and they may vary considerably depending upon the nature and scope of the scheme to be designed. But, semsyntactic analysis of names-of-subject is involved irrespective of the nature and scope of the schemes.

The use of a Scheme for Classification for " Classifying " again implies semsyntactic analysis of names-of-subjects according to that scheme. Therefore, the tool that a Scheme can offer for semsyntactic analysis to its users is the set of postulates and principles that has governed its design work, along with the steps involved in it.

4 Problems of Subject Headings
41 UNKNOWN AND KNOWN DOCUMENTS

In subject cataloguing, the basic assumption is that a document is sought to satisfy some information-need. The information-need of a user can be expressed in terms of one or more names-of-subject. Naturally, the approach for documents to satisfy information-need is expected to be, in the majority of cases, by the names-of-subject. This is so specially when the documents that can satisfy the information-need of a user are " Unknown " to him ; and in the majority of cases, it is so. But when the document is " Known " to him, he may specify it by the name of its author, or collaborator, or by its title, or by the name of its series, or by any combination of these. In other words, in the case of a known document, the approach for it undergoes transformation from the name of its subject to the name of some of its other pertinent attributes, though the purpose of satisfying information-need remains unchanged. For this reason, any

complete document finding system treats every document within its purview simultaneously as unknown and known. Subject Indexing (Cataloguing) corresponds to the treatment of documents as unknown. ACTS (= Author-Collaborator-Title-Series) Indexing (Cataloguing) corresponds to the treatment of documents as known.

42 OBLIGATION OF SUBJECT INDEX

Subject indexing results in a subject index. An ultimate unit record in a subject is a subject entry. The term ' Subject Heading ' denotes a name-of-subject — verbal or notational — used or intended to be used as the heading of a Subject Entry. Traditionally, the term ' subject Heading ', has been used to refer to a name-of-subject in the verbal plane; while a name-of-subject in the notational plane is called a Class Number.

A subject index is designed to respond to subject queries for specific subjects. To satisfy a subject query for a specific subject, the subject index is to provide information about the

1 Documents exclusively devoted to the specific subject;

2 Documents embodying subjects of extension greater than that of the specific subject but having substantial portions devoted to it; and

3 Documents embodying subjects of extension smaller than that of the specific subject, but dealing with some facet of it. The documents on the subjects collateral to the specific subject may contain some information, though indirectly, relevant to the purpose in hand. The subject catalogue, therefore, is to provide further the information about these documents.

43 GROUPING BY ARRANGING

The above mentioned obligation of a subject catalogue makes it imperative to choose and render subject headings — verbal and notational — in such a way that it ensures '' grouping of subjects by arranging.'' The term ' Grouping ' in this context, refers to the establishment of mutual Coordinate-Superordinate-Subordinate (= COSS) relationship among subjects. This relationship can be established and represented in such a way that the arrangement of the names-of-subjects — verbal or notational— would bring the members of the same group in juxta-position among themselves. It can also be established by '' referencing ''— that is, by See and/ or See also subject entries. It has been mentioned in Sec 31 that the concept of '' Chain '' is severely relative. This implies that the concept of ''COSS-Relationship'' among subjects is also relative. In this context, the standardisation of the structure of names-of-subject to determine the mutual relationship among subjects ultimately results in adopting only one point-of-

view, and rejecting all others. As a result, standardization merely ensures primarily consistency in practice without offering facilities for the exploitation of its advantages. This situation calls for the recognition of the other possible relationships among subjects and among the components of the same subject based on other points-of-view. Depending upon different points-of-view, the structure of a name-of-subject — that is, the sequence of the elementary constituents — may vary considerably. This implies that any term denoting an elementary constituent in a name-of-subject may be considerd as a point-of-approach. To overcome the difficulty arising out of standardization and to make provision for necessary and sufficient ponits-of-approach for a name of subject, it becomes necessary to supplement the process of standardization by a process of " referencing."

44 CONSISTENCY IN PRACTICE OF CLASSIFYING

To ensure consistency in practice, the work of subject cataloguing is to be based on a Scheme for Classification — verbal or notational. The development of a Scheme for Classification is postulate-based. The work of classifying — verbal or notational — according to a Scheme is again postulate-based. The work of verbal classifying consists of determining in the verbal plane the structure of a name-of-subject in terms of its elementary constituents recognised by a set of postulates. The result of verbal classifying is a potential subject heading and/or a source for the derivation of subject headings for the specific subject concerned. The work of notational classifying consists of translating the result of verbal classifying into a notation — a language of ordinal numbers. The result of this process is a Class Number. A class Number by itself is a potential subject heading in the notational plane, and/or a source for the derivation of subject headings in the verbal plane for the specific subject concerned. It is always helpful. therefore, to design or adopt a Scheme for Classification — verbal or notational as the case may be — prior to taking up the work of classifying — that is, determination of either subject headings or class numbers.

5 Postulate Based Subject Indexing
51 COLON CLASSIFICATION

Ranganathan's Colon Classification is simultaneously a Scheme for Verbal and Notational Classification. The standardized terms used in its schedule are of additional advantage for verbal classifying. His scheme has been designed on the basis of the explicitly stated postulates forming part of the General Theory of Library Classification enunciated by him. An interpretative version of the set of postulates has been furnished

in Sec 2 of this paper. This scheme satisfies the necessary conditions more effectively for being used as the basis for subject indexing. For the purpose of demonstrating postulate-based subject indexing we may use the Colon Classification conveniently.

52 SUBJECT INDEXING BASED ON VERBAL CLASSIFYING

Let the subject cataloguing based on verbal classifying be considered first. For this purpose, the Colon Classification may be deemed to be a Scheme for Verbal Classification only. Consider the following name-of-subject already mentioned in Sec 26:

In medicine, treatment by chemical therapy of tuberculosis (disease caused by *Mycobacterium tuberculosis*) of lungs of adolescent girls in India in 1930's.

Following the step by step procedure given in Sec 311, and analysing the name-of-subject in the way as shown in Sec 26, we can arrive at the following Chain:

Medicine — (Specials) Female — Adolescent,
Human body > Respiratory system > Lung;
Disease — Tuberculosis: Treatment —
Chemical therapy. World > Asia > India
'1000 > 1900 > 1030's

The above Chain is the result of verbal classifying. It can be used as the basis for deriving subject headings for the specific subject concerned. For this purpose, it is necessary to have a set of rules formulated to implement the policy of subject cataloguing. In general terms, " Grouping by Arranging " is the objective of subject cataloguing. It has been mentioned in Sec 43 that it can be done in two ways: (1) " Grouping by Juxtaposition"; and (2) " Grouping by Referencing." If the policy is to bring the members of the one and the same group in juxtaposition — that is " Grouping by Juxtaposition " — supplemented by the provision of all possible points-of-approach, the rules, may be formulated in the way analogous to those given in the *Postulate-based subject heading for dictionary catalogue system* (6). If the policy is " Grouping by Referencing," the rules may be formulated in the ways analogous to those given in the *Classified catalogue code* (37).

521 *Grouping by Juxtaposition*: *POPSI*

A procedure for implementing the policy " Grouping by Juxtaposition " is to keep the structure of each specific subject heading parallel to the horizontally presented Chain serving as the basis. To achieve economy, only necessary and sufficient number of terms are retained in the specific subject headings. A term is omitted only when such an omission will not disturb the policy.

" Grouping by Juxtaposition " beyond a range of tolerance. How
ever this is done according to a set of rules formulated for this
purpose. For the purpose of alphabetisation each of the punctua-
tion marks used in the heading is assigned an ordinal value lower
than the letter ' A ' or ' a.' The assignment of the ordinal value
to a punctuation mark is to ensure the preferred sequence. For
example, in the case of the Colon Classification being used as a
Scheme for Verbal Classification, the following increasing sequence
of the ordinal values of the punctuation marks ensure the preferred
arrangement of specific subject headings :

) " ' . : ; , — > (

It is possible to introduce some systematisation as apposed
to pure alphabetisation, in the arrangement of the Basic Subjects
among themselves, if necessary. For this purpose, the Basic
Subjects in the schedule of Basic Subjects of the Schemes for Verbal
Classification may be arranged systematically according to some
principles of helpful sequence. Each of the Basic Subjects may
then be represented by an ordinal notation precisely indicating
its position in the systematic sequence of the Basic Subjects. The
notational system should preferably admit of interpolation and
extrapolation: and the assignment of notation to the Basic
Subjects should preferably be governed by the canons for work
in the notational plane. The Basic Facet Number in each specific
subject heading may be used to precede the heading concerned.
The specific subject entries would then call for being arranged
separately from the purely alphabetical entries. They are to be
arranged first in the increasing sequence of the ordinal value of
the Basic Facet Numbers; and within each number, alphabetically
by the specific subject headings. Such an arrang ement would
ensure a systematic sequence of the Basic Subjects among them-
selves.

The   amount   of   artificiality introduced by any one of
the above mentioned procedures would   render the subject cata-
logue too complex to be used directly with advantage by its users.
To neutralise this effect, it becomes necessary to make provision
for all possible normal points-of-approach for any specific subject.
This is done by preparing subject reference entries by using each
of the sought terms cyclically as the first component of the referred-
from subject headings. Use of any economic measure in this
respect is left to the care of the Law of Local Variation. The
work of indexing based on the procedure méntioned above is
called POPSI (= Postulate-based Permuted Subject   Indexing).
This procedure has been extensively demonstrated with rules in
the article *Postulate-based subject indexing for dictionary catalogue
system* (6).

Example:

The procedure mentioned above can be illustrated as follows:

Method 1

1 Heading for the Specific Subject Entry:
   MEDICINE—(Specials) Female — Adolescent, Human body > Respiratory system > Lung; Disease — Tuberculosis: Treatment — Chemical therapy. India.

Note 1.—The Time Facet has been omitted.

   2. The Space Isolate Terms forming the Upper Links in the Space Facet are omitted.

2 Headings for the Subject Reference Entries:

   (a) India/MEDICINE — (Specials) Female-Adolescent, Human body > Respiratory system > Lung; Disease — Tuberculosis: Treatment — Chemical therapy.

   (b) Chemical therapy. India/MEDICINE — (Specials) Female — Adolescent, Human body > Respiratory system > Lung; Disease — Tuberculosis: Treatment —

   (c) Treatment — Chemical therapy. India/MEDICINE — (Specials) Female — Adolescent, Human body > Respiratory system > Lung; Disease — Tuberculosis:

   (d) Tuberculosis: Treatment — Chemical therapy. India/MEDICINE — (Specials) Female — Adolescent, Human body > Respiratory system > Lung; Disease —

   (e) Disease — Tuberculosis: Treatment — Chemical therapy. India/MEDICINE — (Specials) Female — Adolescent, Human body > Respiratory system > Lung;

   (f) Lung; Disease — Tuberculosis: Treatment — Chemical therapy — India/MEDICINE — (Specials) Female — Adolescent, Human Body > Respiratory system >

   (g) Respiratory system > Lung; Disease — Tuberculosis: Treatment — Chemical therapy. India/MEDICINE — (Specials) Female — Adolescent, Human body >

   (h) Adolescent, Human body > Respiratory system > Lung; Disease — Tuberculosis: Treatment — Chemical therapy. India/MEDICINE — (Specials) Female —

   (i) Female — Adolescent, Human body > Respiratory system > Lung; Disease — Tuberculosis: Treatment — Chemical therapy. India/MEDICINE — (Specials)

Note.—Such a subject heading is simultaneously a referred-from and a referred-to heading. Together they provide all the necessary points-of-approach for the specific subject concerned. Further, together they reveal all other recognisable relationships among the elementary constituents in the name of the specific subject which have been disregarded in standardising the structure of the name-of-subject. The implications of a such a subject heading are as follows:

1   Read the heading starting from the word immediately following the virgule and ending it with the word or words preceding it. The specific subject entry will be found under this heading.

2   The denotation of a term in the specific subject heading is readily determinable in the light of the context formed by all the terms preceeding it taken together.

It may be possible to achieve some economy in the number of referred-from headings by adopting some principle of reduction; for example, " No referred-from subject heading beginning with a Speciator Term." According to this principle, the entries *a*, *c*, *e*, *f*, and *g* only are to be prepared. But how far it affects the effectiveness of the subject index is under investigation.

Alternative Style for Method 1

Recently A Neelameghan has suggested a KWOC or KWAL style for Method 1. It consists of preparing the subject reference entries as follows:

(*a*)   India
MEDICINE — (Specials)   Female-Adolescent,
Human body>Respiratory system Lung; Disease.
Tuberculosis: Treatment-Chemical   therapy
India.

(*b*)   Chemical therapy
MEDICINE—(Specials)   Female—Adolescent,
Human body>Respiratory system>Lung; Disease
—Tuberculosis;   Treatment—Chemical   therapy.
India.

(*c*)   Treatment
MEDICINE—(Specials)   Female — Adolescent,
Human body>Respiratory system>Lung; Disease
Tuberculosis: Treatment—Chemical therapy. India.

The entries *d*, *e*, *f*, *g*, *h*, and *i* in Method 1 are also to be prepared in the above style.

In this style, each of the potential points-of-approach by cyclic permutation, is used as the main heading; and the specific subject heading as it is, is made the subheading. This style is expected to be more easily understandable by the users. For, the name of the Basic Subject immediately following the approach

term would lead the user to the region of the specific subject heading he is interested in

The implications of such a subject heading are as follows:
1   The point-of-approach under consideration occurs in different roles as revealed in the specific subject headings forming the subheadings under it.
2   The denotation of a term in the specific subject heading is readily determinable in the light of the context formed by all the terms preceding it taken together.

It may be possible to achieve some economy in the number of referred-to headings in the same way as mentioned under Method 1 above.

Method 2
1   Heading for the Specific Subject Entry:
L-9H-9D
MEDICINE — (Specials) Female — Adolescent, Human body > Respiratory system > Lung; Disease — Tuberculosis: Treatment — Chemical therapy. India.
2   Headings for the Subject Reference Entries:
(a) MEDICINE —(Specials)   Female — Adolescent, Human body > Respiratory   system > Lung; Disease — Tuberculosis: Treatment — Chemical therapy. India   L-9H-9D
(b) Indian/MEDICINE — (Specials)   Female — Adolescent,   Human body > Respiratory   system > Lung;   Disease — Tuberculosis: Treatment — Chemical   therapy.   L-9H-9D
(c) Chemical therapy.   India/MEDICINE — (Specials) Female — Adolescent, Human body > Respiratory system > Lung;   Disease — Tuberculosis: Treatment —   L-9H-9D
(d) Treatmen· — Chemical therapy. India/MEDICINE — (Specials) Female — Adolescent, Human body > Respiratory system > Lung; Disease — Tuberculosis: L-9H-9D
(e) Tuberculosis: Treatment — Chemical   therapy. India/MEDICINE — (Specials)   Female — Adolescent,   Human body > Respiratory system > Lung: Disease —   L-9H-9D
(f) Disease — Tuberculosis: Treatment — Chemical therapy. India/MEDICINE — (Specials) Female— Adolescent, Human body > Resp ratory system > Lung;   L-9H-9D

(g) Lung; Disease — Tuberculosis: Treatment — Chemi-
    cal   therapy.   India/MEDICINE — (Specials)
    Female — Adolescent,   Human   body > Respi-
    ratory   system >   L-9H-9D

(h) Respiratory   system > Lung;   Disease — Tubercu-
    losis;   Treatment — Chemical   therapy.   India/
    MEDICINE — (Specials)   Female — Adolescent.
    Human   body >   L-9H-9D

(i) Adolescent,   Human body > Respiratory   system >
    Lung;   Disease — Tuberculosis;   Treatment —
    Chemical therapy.   India/MEDICINE — (Specials)
    Female —   L-9H-9D

(j) Female — Adolescent,   Human body > Respiratory
    system > Lung;   Disease — Tuberculosis: Treat-
    ment — Chemical   therapy.   India/MEDCINE —
    (Specials)   L-9H-9D

Note.—Such a subject heading, again in a different sense,
simultaneously a referred-from and a referred-to heading. Together
they provide all the necessary, points of approach for the
specific subject concerned. Further, together they reveal all
other recognisable relationships among the elementary consti-
tuents in the name of the specific subject which have been dis-
regarded in standarding the structure of the name-of-subject. The
implications of such a subject heading are as follows:
    1 Read the heading starting from the word immediately follow-
ing the virgule and ending with the word or words preceding it.
The specific subject entry will be found under this heading in the
broadly systematic (classified) part of the catalogue under the
Basic Subject Number L-9H-9D
    2 The denotation of a term in the specific subject heading is
readily determinable in the light of the context formed by all the
terms preceding it taken together. It may be possible to achieve
some economy in the number of referred-to headings in the same
way as mentioned under Method 1 above. It may be noted that
Method 2 is fully amenable to the alternative style for Method 1
mentioned above.

522 *Grouping by Referencing*
    A procedure for implementing the policy " Grouping by
Referencing " consists of the following steps:
    1 To ascertain the Sought Links in the Chain;
    2 To derive a subject heading from the Last Sought Link by
first reversing the sequence of the words in it, and then keeping

in it only the words necessary and sufficient to specify the specific
subject;

3   To use the subject heading arrived at in Step 2 as the heading
of the specific subject entry;

4   To derive a subject heading from each of the Upper Sought
Links in the same way as mentioned in Step 2; and

5   To use each of these subject headings as the referred —from
heading of a *see also* subject entry using the specific subject heading
as the referred-to heading.

Example:

The procedure mentioned above can be demonstrated as
follows:

1   Basic Chain:

Medicine — (Specials)   Female — Adolescent,   Human
body > Respiratory   system > Lung: Disease —
Tuberculosis: Treatment — Chemical   therapy.
World > Asia > India   '1000 > 1900   > 1930's

2   Heading for the Specific Subject Entry:

India.   Chemical therapy: Tuberculosis: Lung, Ado-
lescent — Female.

Note.—The punctuation mark following each term indicates
the category of the elementary constituent to which it belongs.
It may be used only to augment   the semantic   value of the
words forming the heading. " Grouping by Referencing " does
not call for their being assigned any ordinal values and being
regarded in alphabetisation.

3   Headings for the Subject Reference Entries :

(*a*)   Chemical therapy: Tuberculosis; Lung, Adolescent —
Female

(*b*)   Treatment : Tuberculosis: Lung, Adolescent — Female

(*c*)   Tuberculosis;   Lung,   Adolescent — Female

(*d*)   Lung, Adolescent — Female

(*e*)   Respiratory system,   Adolescent — Female

(*f*)   Adolescent — Female — Medicine

(*g*)   Female — Medicine

(*h*)   Medicine

Note.—The procedure   illustrated above has   been exten-
sively demonstrated in the *Classified catalogue code* (37).

523   *Logical Unit-based Subject Indexing* (= LUSI)

A scheme for Verbal Classification can form the basis of a
variety   of indexing methods;   for example, Post-coordinate
Indexing at one extreme and POPSI at the other. It is possible
to recognise a system in between the two extremes, which aims
at a well-proportioned combination of the advantages of both
the systems.   The procedure of deriving subject   headings used
by such a system consists of the following steps:

1   Breaking the basic Chain, whenever warranted, into a few Logical Units according to a set of rules formulated for this purpose;

2   Deriving a subject heading from each unit according to any one of the procedures mentioned in Sec 521 and 522; and

3   Using the subject heading derived from each unit as an "as-if" specific subject heading for the document concerned.

In this procedure, a document, wherever warranted, will have more than one specific subject headings. The referencing to provide the necessary points-of-approach for each specific subject heading is done in the same way as shown in Sec 521 or 522 as the case may be. This system of subject indexing calls for the maintenance of the documents and/or file of main entries for them arranged in a serial sequence, each document or its main entry being represented by unique number. The file of specific subject entries is maintained separately. A specific subject entry consists of the specific subject heading and of the serial numbers of the documents dealing with the subject, arranged in a convenient way analogous to that in an entry in a post-coordinate indexing system. The file of subject reference entries is maintained separately to provide all the necessary points-of-approach. A search-strategy for a specific compound subject involving more than one logical unit, consists of searching the entry for each unit, and if found, comparing them to ascertain the common serial numbers posted on them. A document bearing a common serial number is expected to deal with the specific subject concerned.

Example :

The procedure mentioned above may be illustrated as follows:

1   Basic Chain:

> Medicine — (Specials) Female — Adolescent, Human body Respiratory system Lung; Disease —Tuberculosis: Treatment — Chemical therapy. World Asia India '1000 1900 1930's

2   Logical Units

> (*a*) Medicine. Asia > India
> (*b*) Medicine: Treatment — Chemical therapy
> (*c*) Medicine; Disease — Tuberculosis
> (*d*) Medicine, Human body > Respiratory system > Lung
> (*e*) Medicine — (Specials) Female — Adolescent

Note.—1   Each of the above Chains is called a "Logical Unit" because it has been deduced from a Basic Chain.

2   The Logical Units have. been derived according to the following rules:

> (*a*) Simple Basic Subject. Space Facet

(b) Simple Basic Subject: Energy Facet
(c) Simple Basic Subject; Matter Facet
(d) Simple Basic Subject, Personality Facet
(e) Compound Basic Subject — that is, the Basic Facet as a whole.

3 Procedure for Deriving Subject Headings.

The procedure that may be adopted for deriving the specific subject heading and the subject reference entries from each of the Logical Units will depend upon the policy of subject indexing: (1) "Grouping by Juxtaposition; or (2) "Grouping by Referencing" They are demonstrated in Sec 521 and 522 respectively.

Note.—Investigation on LUSI is in progress at DRTC. The results of initial research in a similar line has been reported in the article *Chain procedure and microsubjects* (28, 29).

53 SUBJECT INDEXING BASED ON NOTATIONAL CLASSIFYING

The result of subject indexing based on notational classi-fying is a conventional Classified Catalogue. It has already been mentioned earlier that a Scheme for Verbal Classification is amenable to translation into an artificial language of ordinal numbers; and when translated it results in a Scheme for Notational Classification. Any Scheme for Notational Classification is then simultaneously a Scheme for Verbal Classification. This implies that a Class Number can be readily deemed to be a hori-zontally presented Chain in the notational plane; and it can be translated, with reference to the Scheme concerned, into a Chain in the verbal plane — presented either vertically or horizontally. Once the Chain in the verbal plane is determined, it can be used as the basis for the derivation of all the necessary subject headings in the verbal plane for the specific subject concerned, by employ-ing any one of the procedures mentioned in Sec 52, or by modi-fying the procedure suitably to make it compatible with a Particular situation.

Notational classifying has to be based on verbal classifiyng. Verbal classifying involves the step by step procedure given in Sec 311 and the analysis of the name-of-subject in the way as shown in Sec 26. The result of verbal classifyng is a Chain in the verbal plane. A Chain in the verbal plane is the basis for constructing the Class Number on the one hand, and for deriving the subject headings on the other.

When the starting point is a Class Number — that is, a Chain in the Notational Plane — it is translated into a Chain in the verbal plane with reference to the Scheme for Classification concerned. The resulting Chain in the verbal plane is used as the basis for the derivation of the subject headings for the specific subject concerned.

The points mentioned above may be illustrated with reference to the Colon Classification as follows:

1 Coextensive Name-of-Subject
   In medicine, treatment by chemical therapy of the tuberculosis (disease caused by *Mycobacterium Tuberculosis*) of lungs of adolescent girls in India in 1930's.

2 Chain in the Verbal Plane
   Medicine — (Specials)   Female — Adolescent,   Human body > Respiratory   system > Lung;   Disease — Tuberculosis: Treatment — Chemical therapy. World > Asia > India '1000 > 1900 > 1930's

3 Class Number (= Chain in the Notational Plane)
   L-9H-9D,45;4-1:6-3·44'N3

The above findings lead to the conclusion that a Class Number according to any Scheme for Notational Classification can serve as the basis for the derivation of the subject headings for the specific subject represented by it; but, the derivation of subject headings need not essentially be based in all cases on Class Numbers.

It will further be evident from the above discussion that the Chain Procedure based on Notational classifying possesses all the potentiality of taking the form of logical Unit-based Chain Procedure. This has already been demonstrated in the *Chain procedure and microsubjects* (28, 29).

6 What is Chain Procedure
61 FUNDAMENTAL ISSUES RELATING TO CHAIN PROCEDURE

The following fundamental issues emerges from the discussion in the earlier sections:

1 Any systematised body of ideas is a product of a treatment on a subject.

2 Organisation of subjects calls for their classification.

3 Classification of subjects, in turn, calls for the recognition of their structures.

4 A subject *qua* subject is a conceptual entity; naturally its structure is not readily recognisable.

5 A subject can be named coextensively by a descriptive statement in natural language.

6 A subject is sought by its descriptive name; and any substantive term in the name may be a point-of-approach.

7 The structure of a name of subject is readily recognisable.

8 A subject can be named descriptively in terms of varied structures.

9 Classification of names-of-subject calls for the standardisation of their recognisable varied structures.

10 It is possible to standardise the varied structure of names-of subject on the basis of a coherent set of postulates about the

structures of names-of-subject.

11 Any scheme for the classification of subjects is essentially a scheme for the classification of the names-of-subject.

12 The design of a Scheme for Classification is based on a coherent set of postulates standardising the structures of the different categories of names-of-subject; the postulate may be impliedly included or explicitly stated.

13 A Scheme for Classification may be either a Scheme for Verbal Classification or a Scheme for Notational Classification.

14 A Scheme for Notational Classification is a translation of the same scheme in the verbal plane, into an artificial language of ordinal numbers.

15 A Scheme for Notational Classification is simultaneously a Scheme for Verbal Classification.

16 The result of classifying according to a Scheme for Verbal Classification is a Chain in the verbal plane.

17 The result of classifying according to a Scheme for Notational Classification is a Chain in the notational plane; it can be translated into a Chain in the verbal plane with reference to the scheme concerned.

18 A Chain — whether in the verbal plane or in the notational plane — serves as the basis for systematic derivation of subject headings in the verbal plane for the specific subject concerned; it is done according to a set of rules — precise, contradiction — free and consistent — formulated to implement the policy of subject indexing in hand.

62 DEFINITION OF CHAIN PROCEDURE

In the context of the fundamental issues mentioned in Sec 61, the term 'Chain Procedure' can be defined as follows:

Chain Procedure: ·Any systematic method of deriving subject headings for a specific subject, involving the determination of the Chain in which the subject concerned is the Last Link.

The Chain Procedure aims at implementing the policy of subject indexing — Grouping by Juxtaposition, or Grouping by Referencing, as the case may be; and at providing the necessary and sufficient number of points-of-approach for any specific subject.

63 STEPS IN CHAIN PROCEDURE

The Chain Procedure involves all the Steps 1 to 6 mentioned in relation to semsyntactic analysis of names-of-subject in Sec 311. In addition to those, the following steps are involved:

Step 7. Determination of the different kinds of Link — such as, Sought Link, Unsought Link, and False Link (= Determination of Kinds of Link).

Step 8   Derivation of the subject heading for the specific subject entry on the basis of the Last Sought Link, according to a set of rules formulated to implement the policy of subject indexing in hand (= Derivation of Specific Subject Heading);

Step 9   Derivation of the subject heading for the subject reference entry on the basis of each of the Upper Sought Links according to a set of rules formulated to implement the policy of subject indexing in hand (= Derivation of Reference Subject Heading).

64   DIFFERENT VERSIONS OF CHAIN PROCEDURE

It is possible to have different versions of the Chain Procedure depending upon the variation of several factors — such as,

1   The set of postulates about the elementary constituents of the universe of subjects;

2   The set of postulates relating to the sequence of the elementary constituents in names-of-subject;

3   The policy of subject indexing: Grouping by Juxtaposition, or Grouping by Referencing;

4   The set of rules for deriving subject headings for a specific subject, from the different Sought Links of its Chain;

5   The nature of the Scheme for Classification — verbal or notational — governing the formation of the Chain.

65   RULES FOR DERIVING SUBJECT HEADINGS

The rules for deriving subject headings from a Chain forms an integral part of the Chain Procedure; and they can be so formulated as to yield several alternative patterns of arrangement of the elementary constituents. If any pattern of arrangement is clearly defined, a corresponding set of rules for the derivation of subject headings can be formulated.

66,   DERIVATION OF SUBJECT HEADINGS FROM CLASS NUMBER

A Class Number, constructed according to a Scheme for Notational Classification, may form the basis for applying the rules of the Chain Procedure for deriving subject headings.   This is because, a Class Number is a Chain in the notational plane.   In designing a scheme and in notational classifying according to it, the Steps 1 to 5 of the Chain Procedure are always implied.   The starting Step in this context is to translate the Chain in the notational plane into a Chain in the verbal plane with reference to the scheme concerned.   Then follow the Steps 7 to 9 of the complete Chain Procedure.   These findings imply that a Class Number is not an essential condition for applying the rules of the Chain Procedure;   nor is the Chain Procedure, in any sense, always dependent on a Scheme for Notational Classification.

7 Development of Chain Procedure

71 PRE-NAMING DEVELOPMENT

The subject index made up of ' Characteristic Division Entries' prescribed by the *Classified catalogue code* in 1934 was in reality nothing more than an index to the unit-terms used in the schedules of the Colon Classification of 1933   But the procedure of deriving the subject headings for these entries involved all the necessary steps of the Chain Procedure.   For instance,

1   The design of the *Colon   classification* was based on a set of postulates about the structure of   names-of-subject, though the postulates were mostly impliedly included and   not explicitly stated ;

2   Classifying according to the scheme was based on this set of postulates which involved verbal classifying followed by notational classifying ;   and

3   The Class Number — that is, the Chain in the notational plane — translated into   Chain in the verbal plane formed the basis for deriving the subject headings for the " Characteristic Division Entries " according to a set of rules formulated for this purpose.

Evidently, the procedure satisfied all the necessary conditions of the Chain Procedure, though it was not called so.   The demonstration of the procedure was based on Colon   Class Numbers only.   But, Ranganathan said " Rule 31 and its sub-divisions are not altogether without some useful suggestions when a different classification scheme is used." (36).

72 NAMING OF CHAIN PROCEDURE

In pursuance of his idea about the   application of his procedure, Ranganathan first applied it to the class numbers constructed according to the *Decimal classification* of Melvil Dewey. He took examples of compound subjects going with the Basic Subjects " Economics " and " History." The steps of his procedure remained the same ; but the rules about the pattern of the subject headings to be derived from the Chain were much improved upon.   Ranganathan named   the whole method as " Chai Procedure. "

On the basis of his experience gained by applying the Chain Procedure to DC class numbers, Ranganathan refined the rules about the pattern of subject headings, and used them for deriving subject headings from class numbers constructed according to his *Colon classification*.   He incorporated all his findings about the Chain Procedure in his *Theory of library catalogue* (43).

Ranganathan concluded in his *Theory* that the process of determining the specific subject of a document and that of arriving at its class number were identically the same till the point of step-

ping out of the verbal plane and entering into the notational plane. This finding of his led him to conclude further that the Chain Procedure as a method of deriving subject headings had got the necessary potentiality of being applied to the class numbers constructed according to any scheme for classification. He said, "Apart from these general hints, which may be applied in association with any scheme of classification, each scheme of classification needs special rules to facilitate objective determination of headings for the specific subject entries. The better the scheme satisfies the canons of classification, the fewer will be the special rules required."

These conclusions of Ranganathan widened the scope of further research on the Chain Procedure. The theoretical foundation of the Chain Procedure as furnished in the earlier sections developed during the last five decades. A good amount of research has been· responsible to bring about this development. The results of those researches are mentioned in the following subsections.

73   POST-NAMING DEVELOPMENT

731   *Class Number-based Chain Procedure*

1946: M L Nagar demonstrated that the Chain Procedure was a definite, impersonal, mechanical, and objective method of deriving the specific subject headings and the subject reference entries (25). He stressed that a scheme for classification, even if it were faulty, might be of help in deriving subject headings. The effectiveness of the procedure, he concluded, would reach its ideal if the scheme for classification could satisfy all the canons of classification in its design, and if it observed the principle of classifying coextensively.

1947: P K Garde showed that the Chain Procedure would be equally applicable to the class numbers constructed according to any scheme for classification (14). He suggested some modifications to the rules of the Chain Procedure specially in regard to complex subjects.

1950: B C Vickery enumerated the five requirements of an exhaustive connective index; and he used them as the criteria to evaluate the different kinds of index (49). Regarding an alphabetical index he remarked as follows:

" It is thus becoming recognised in theory that an alphabetical index must be consciously derived from a systemaic organisation of the subject matter. Ranganathan has even devised a technique ' Chain Procedure ' for transforming the relations in the synthetic classification system such as his own, into the cross reference entries, of an alphabetical index."

1951: B I Palmer and A J Wells demonstrated how the Chain Procedure could be adopted to derive subject headings and feature

headings on the basis of Class numbers constructed according to an enumerative scheme — such as, the Decimal classification (30). They enumerated the difficulties that would arise, together with the method of dealing with each difficulty. Their findings ultimately led to the adoption of the Chain Procedure for the *British national bibliography* with necessary modifications of its rules. Reviewing the *British national bibliography*, B C Vickery remarked, " The effect of this method is that the whole chain of classes is displayed in the index and even if the user looks up an entry not corresponding exactly to the subject he seeks, he is led to the right region of classification. The feature words he is after, can then quickly catch his eyes. The second useful aspect of this procedure is that it displays relations not displayed by the classified list itself." (48).

1953 : T N Koranne illustrated the use of the Chain Procedure in arriving at class index entries to show its following attributes: (1) mechanisation of the choice and rendering of subject headings. (2) help to the readers who may bring up any isolate term in the name of his subject of interest as the point-of-approach : and (3) symbiosis between classification and cataloguing (19).

1954 : The Chain Procedure can be used to derive subject headings both for the classified catalogue and for the dictionary catalogue. But the rules of the Chain Procedure used for the classified catalogue do not prove equally helpful if used for the dictionary catalogue. Ranganathan showed this unhelpfulness in 1954 (35). He emphasised the need of further research to formulate a helpful set of rules of the Chain Procedure for use in the dictionary catalogue. J Mills gave a demonstration of the application of the Chain Procedure as practised by the *British national bibliography* to point out its specific advantages over other indexing methods (24).

1955 : J Mills demonstrated the application of the rules of the Chain Procedure for deriving subject headings from class numbers constructed according to any scheme for classification. For this purpose he took class numbers constructed according to the *Decimal classification*, *Universal decimal classification*, *Bibliographic classification*, and *Subject classification*. He concluded, " So long as the principle of an efficient division of labour is observed — not repeating in the alphabetical index work (that is, division of a subject) which has largely been done in the classification, then chain procedure can be applied successfully and easily to all the major schemes, whatever notation they use, even to the *Subject classification*, whose structure is quite different from all the other schemes " (22). The success of an experiment of deriving subject headings by applying the Chain Procedure to the class numbers constructed according to the *Decimal classifi-*

cation was reported by C W Doughty (12).

1956: Ts M Berdichevskaya dealt with the application and advantages of the Chain Procedure as a method of deriving all the necessary and sufficient subject headings for a specific subject from a class number constructed according to any scheme for classification (3). She noted the effectiveness of its use in developing the alphabetical subject index to the classified part of the catalogue.

1957: E J Coates furnished useful notes with numerous examples on the general principles to be followed in adopting the rules of the Chain Procedure for deriving subject headings to meet the requirements of the dictionary catalogue (11). J Mills showed that the Chain Procedure was not very much disturbed by the defects in the scheme for classification used (21). Of course, he admitted that if the Chain was not clear, due to defects in the classification used, then the post indexing step was to that extent less efficient. A J Wells referred to a number of difficulties in applying the Chain Procedure to class numbers constructed according to the *Decimal classification*; and he attributed those difficulties to the structural defects of the scheme (50). He explained how some of those difficulties have been resolved.

1958: Commenting on the modifications of the Chain Procedure used in the experimental fascicule of the *Indian national bibliography*, A J Wells said that it was an attempt to achieve economy at the cost of convenience (51). He remarked, "Of course, for the 448 items listed, she (Law of Parsimony) may have her head and no great harm done, but even if there were only ten times this number of items, I think we would find the index exasparating."

1959: H N Ananda Ram showed that the weakness of the subject heading derived by the Chain Procedure was largely due to the faults of the scheme for classification used (1). B C Vickery showed how by means of the Chain Procedures, the problem of completely flexible generic survey was solved. He established, "Chain Procedure for compounds of up to N terms tends to need 2N entries, multiple entry to need $1 + 2 + \ldots N$ entries, which is greater than 2N if $N = 3$. He demonstrated the application of the Chain Procedure for deriving subject headings from the class numbers constructued according to the faceted scheme for classification included for the test of its efficiency in the Aslib Research Project at the Carnfield College of Aeronautics (47).

1960: J Mills explained how the Chain Procedure had solved the problem of a subject index becoming unwieldly by ensuring systematic and economic indexing of every key-word forming part of the name of a compound subject (23). E J Coates said that it was left to S R Ranganathan to suggest that the method under the name Chain Procedure should be applied rigorously

as a systematic technique for subject indexing a classified catalogue (10). He examined the application of the Chain Procedure to study its significant attributes: and he arrived at the following conclusions: '' There can be little doubt that the claims made for economy of Chain Procedure are justified. Chain Procedure does offer a methodical treatment of subject indexing far in advance of any alternative approach yet propounded. On the whole, Chain Procedure is a considerable step towards mechanical subject indexing in a classified catalogue. Finally it demonstrates subject relationship by alphabetical collocation of entries on different aspects of the same subject. It is limited in this respect only by the extent to which the scheme for classification used, fails to ' modulate ' fully in the listing of terms in hierarchy." He also demonstrated how to adopt the Chain Procedure for the derivation of multiple subject headings to meet the requirements of a alphabetico specific catalogue. He distinguished the problems relating to the application of the Chain Procedure to the class numbers cons'ructed according to the *Decimal classifiaction* as follows: A notation is primarily a means of mechanising the order of terms in a systematic sequence. It need not necessarily reflect the hierarchical relations between terms, and in DC it often does not. So it is insufficient merely to rely upon the digits of DC class numbers to produce all necessary entry words. The other class of problem arises from omissions and errors in the classification schedule itself. A fairly common difficulty in chain indexing from DC arises from incomplete modulation of terms in hierarchy. Whereas in chain procedural indexing to the Colon scheme, the subject indexer can virtually limit the field of his concern to the digits of the notation. in applying the technique to the *Decimal classification*, he must maintain a close watch on the classification schedule of terms. as well. Along with this. he recorded his experience of adopting the Chain Procedure for the *British national bibliography*, and the *British catalogue of music.*

1961 : Ts M Berdichevskaya illustrated the special advantages of the use of the Chain Procedure for deriving subject headings for the classified catalogue in a specialist library (4).

1962 : P K Garde convincingly established that the *Colon classification* coupled with the Chain Procedure has provided the catalogue with a foundation which enable it to realise its " deep function " to its highest potential (15). G R Parkhi made an attempt to show that of all the procedures for deriving subject headings to be used to compile the alphabetical subject index supplementing the classified part, the Chain Procedure was among the most effective ones (31). N N Passi discussed in depth about the theoretical foundation of the Chain Procedure pointing out its effectiveness and limitations in association with the classified

catalogue and the dictionary catalogue (32).

1963 : D J Foskett prescribed the Chain Procedure for deriving subject headings from class numbers constructed according to his *London education classification* (13). He illustrated its use and suggested, " .... in a card index it is just as economical to make complete classified entry under each facet, rotating the terms, so that each comes to the front in tern." The International Federation for Documentation (FID) recommended the use of the Chain Procedure for deriving subject headings from the class numbers constructed according to the *Universal decimal classification* (UDC) (44). G R Pendrill illustrated the application of the Chain Procedure to derive subject headings from class numbers constructed according to the *Bernard classification* (33).

1967 : B S Ramananda pointed out the helpfulness of the subject headings derived by the Chain Procedure in revealing the deficiencies in a scheme for classification and in suggesting methods for rectifying them (34). T V Subramanyan suggested that a cyclic permutation of the constituent terms in the specific subject headings derived by applying the Chain Procedure, to generate the headings for the subject reference entries would increase the efficiency of the subject index (45).

1968 : H Bose illustrated the incompatibility of the rules of the Chain Procedure used for CC class numbers, with UDC class numbers (7).

1970 : R A Leonov demonstrated the application of the Chain Procedure for deriving subject headings from the class numbers constructed according to (1) *Colon classification*: (2) *Classification for labour protection and industrial hygiene*, designed by the International Information Centre for Labour Protection in Geneva; (3) *Universal decimal classification*; and (4) *Library bibliographical classification*, designed by the Lenin Library (20). He noted its major advantages as follows: (1) It makes provision for all the necessary points-of-approach for a specific subject; and (2) It is readily amenable to computerisation for its high degree of formalisation. P Kaula evaluated the contribution of the Chain Procedure in establishing a well-balanced symbiosis between classification and cataloguing (18).

1971 : G Bhattacharyya distilled out the theoretical foundation of the procedure of deriving subj ct headings for preparing a relative index as suggested by Melvil Dewey, to show that the Chain Procedure was essentially different from Dewey's procedure (5). This investigation led to the conclusion that Dewey's procedure and the Chain Procedure marked two distinct successive stages of development of the theory of subject headings.

732 *Postulate-based Chain Procedure*

Researches on the class number-based Chain Procedure

gradually led to the realsation that what appeared to be its depen
dence on class numbers, was in depth its dependence on the postu-
lates about the structures of names-of-subject forming the founda-
tion of the design and development of the scheme concerned. Its
immediate implications were that the Chain Procedure had all
the nesessary potentiality of being developed into different ver-
sions depending upon the variation of several factors — such as,
the set of postulates about the structures of names-of-subject,
policy of subject indexing, and the set of rules for deriving subject
headings.

1953 : The first development of the Chain Procedure in the
direction mentioned above took place in the method of deriving
subject headings developed by A Thompson (46). His method
was based on a system for analysis of names-of-subject into six
elementary constituents: Realisation, Material, Process and
Problem, Place, Time, and Form.

1963 : Another development of the Chain Procedure in the
same direction took place in the method of deriving subject head-
ings for the *British technology index* (8). This was an achievement
of E J Coates.

1964 : Ranganathan demonstrated how the choice of the
name-of-subject and its rendering can be done by the facet-analysis
based on the set of postulates and principles forming part of the
General Theory of Library Classification developed by him (42).
After showing that the subject headings constitute an artificial
language, he pointed out that the use of facet-analysis for deriving
subject headings did not amount to using class numbers. Ex-
plaining the adaptation of the Chain Procedure for the alpha-
betical subject index, and for the derivation of subject headings
for the *British technology index*, E J Coates described it as a means
just opposed to arbitraly limited permutation of index compo-
nents (9). He discussed its economy together with the problem
of unsought headings and the need to exclude genus-species pairs
from qualifying terms. In this connection he dealt with the role
of the Chain Procedure and its limitations in drawing attention
to "distributed relatives".

1969 : Ranganathan discussed the difficulties in the use
preparation, and maintenance of predetermined subject headings
using the *Subject headings used in the dictionary catalogues of the
Library of Congress*, as the Type (41). He showed that the first
five steps in the systematic procedure for subject analysis, based
on postulates, for the post-determination of class numbers were
also the steps for the determination of subject headings; the
further steps in the procedure for classifying were not at all necessary
to determine the subject headings. It was not necessary,
he said, to march on the procedure up to the class number and

then come back to the subject heading on the basis of the class number. He discussed the problems awaiting pursuit in the improvement of the post determination of subject headings in respect of the syntax of the terms in the multiple subject headings derived by forward rendering method. In this connection he mentioned about the experiment in the possibility of removing the residual difficulties by the use of indicator digits. G Bhatta-charyya and A Neelameghan demonstrated that the features of the classified catalogue system could be incorporated to a great extent in the dictionary catalogue system without affecting its advantages, by developing POPSI (= Postulate-based Permuted Subject Indexing) (6). POPSI has been described in Sec 521. From the very beginning, the *British national bibliography* was following the version of the Chain Procedure based on class numbers constructed according to the *Decimal classification*, and its expansion done at the local level, for deriving subject headings. From 1971, this version of the Chain Procedure has been discontinued. In its place, another version of the Chain Procedure is being followed. This version is based on a set of postulates and principles about the structures of names-of-subject, formulated by Derek Austin in collaboration with his colleagues in the Subject Team of the *British national bibliography*. The system of subject indexing is known by the acronym PRECIS (= Preserved Context Indexing System). This version is based on the system of subject analysis into categories — such as, Environment, Key system, Effect/Action, Active Concept, View-point/Perspective, Study Region/Sample Population, Property, and Part (2). The specific subject heading for a compound subject is derived from the Last Link of the Associated Chain. The subject headings for subject reference entries are derived from the specific subject heading concerned by a systematic cyclic permuta-tion of its components. PRECIS owes its origin to a decision of producing the *British national bibliography* by computer. The approach of PRECIS appears to be somewhat similar to that of POPSI. The fundamental difference between these two versions of the Chain Procedure appears to be that PRECIS does not recognise the concept of Basic Subjects, while POPSI does. A comparative study of the relative helpfulness of the two sets of postulates and principles forming the basis of POPSI and PRECIS respectively is in progress in the Documentation Research and Training Centre.

733   *Logical Unit-based Chain Procedure*
In 1967, A Neelameghan and G Bhattacharyya showed that the class index entries derived by applying the Chain Procedure to the full class number of a micro-subject was unhelpful (28). They suggested that a micro-subject should be treated as a multi-

focal one, and it should be divided into convenient smaller compound subjects going with one and the same Basic Subject. A main entry, they said, could be prepared for each of these compound subjects; and the class index entries could be derived from each class number by applying the Chain Procedure. A method of rendering the class index entries by cyclic permutation of the terms which would preserve the original syntax was also demonstrated by them. The depth classification of Motor Vehicle Production Engineering was used to illustrate the new technique devised by them. Evidently, the technique is fully operative without class numbers also. It has already been mentioned in Sec 523 that further investigation in a similar line is in progress at the Documentation Research and Training Centre.

734 *Computerised Chain Procedure*

With the introduction of the computer for information retrieval, a new dimension has been added to the research on the Chain Procedure. Since 1968, a research project on computerised information retrieval system has been in progress at the Documentation Research and Training Centre.

In the context of a computerised system, different entries to provide the different points-of-approach for a specific subject are not warranted. On the contrary, a single entry incorporating all the necessary points-of-approach should prove sufficient. The computer is programmed to (1) help query specification and formulisation, (2) search, and (3) to deliver the output according to the specification of the user. In every operation, the Chain Procedure has a role to play. For instance, it is used for deriving the specific subject headings to be used to store the entries; (2) deriving the subject reference entries to help query specification and formalisation, and (3) for delivering the output with a subject index.

The DRTC experiment on computerised information retrieval system has found the Chain Procedure fully amenable to computerisation (16, 17). At the initial stage, programs were written to generate subject headings both from class numbers and feature headings following the conventional reverse rendering method of the Chain Procedure. They were written in PLAN and Autocoder for being used in ICL 1900 series and IBM 1400 Series of computers respectively.

Programing for reverse rendering method of the Chain Procedure was found to be complex.

Preliminary work on POPSI was completed in 1968. It was realised from the very beginning that the computerisation of POPSI would be quite simple. Therefore, immediately after the success-

ful completion of programming for the reverse rendering method
of the Chain Procedure, the work of programming for POPSI
was taken up. POPSI has been found quite compatible with the
computerised information retrieval system. The programme
for POPSI has been written in PLAN and FORTRAN-4 for
being used in ICL 1900 Series and IBM 360 Series respectively.

It has already been mentioned in Sec 731 and 732 that R A
Leonov also has found the Chain Procedure fully amenable to
computerisation; and for the *British national bibliography* the
subject reference entries in PRECIS are generated by the computer
used.

8 Conclusion

The results of the investigations on the Chain Procedure
have successfully established that the denotation of this concept
is considerably extensive; and its connotation fairly intensive.
New dimensions are continuously being added to the researches
on the Chain Procedure. It is indeed a classic contribution of
Ranganathan. There is no doubt that considerable work has
been done on it; and the achievement also are quite significant.
But what has been achieved, in the present context, appears to be
far less than what is yet to be achieved. Further, the achievements
have contributed more to complicate and increase the problems,
and less to simplify and reduce them. The researches on the
Chain Procedure are yet to go a long way before the last word
about it is said. It is quite encouraging to note that the researches
on the various facets of the Chain Procedure are continuously
in progress all over the world.

91 Bibliographical Reference

1 Sec 731 ANANDA RAM (H N). Chain indexing: Its signi-
            ficance. (Ind lib. 14;1959;131–4).
2 Sec 732 AUSTIN (Derek) and BURCHET (Peter). PRECIS:
            A rotated subject index. 1969.
3 Sec 731 BERDICHEVSKAYA (Ts M). Chain Procedure of
            Ranganathan for the derivation of subject
            headings for the classified catalogue. (*In* Library
            science in the capitalistic countries. Ed. 2 1956.
            p. 46–54).
4 Sec 731 ——. Subject index for the classified catalogue
            in scientific libraries. 1961.
5 Sec 731 BHATTACHARYYA (G). Relative index and chain
            procedure. (Lib sc. 8; 1971; Paper S).
6 Sec 52 —— and NEELAMEGHAN (A). Postulate-based
       732 subject heading for dictionary catalogue system.
            (Annual seminar, (DRTC). 7; 1969; Paper CA).

7   Sec   731 BOSE (H).   Chain indexing and *Universal decimal classification*.   (Ind lib. 22; 1968; 234–9).

8   Sec   732 COATES (E J).   Aims and methods of the *British technology index*.   (Indexer. 3; 1963; 146–52).

9   Sec   732 ——.   Chain procedure: Application to the *British technology index*.   (Electro-technology. 8, 1; 1964; 33–9).

10 Sec   731 ——.   Subject catalogues: Headings and structure. 1960.

11 Sec   731 ——.   Use of BNB in dictionary cataloguing. (Lib Assoc rec. 59; 1957; 197–202).

12 Sec   731 DOUGHTY (D W).   Chain Procedure subject indexing and featuring a classified catalogue. (Lib Asso rec. 57; 1955; 173–8).

13 Sec   731 FOSKETT (D J).   London education classification. 1963.

14 Sec   731 GARDE (P K).   A propos of the last link index entry of the CC Code. (Ind lib. 2; 1947; 49–55).

15 Sec   731 ——.   Ranganathan's contribution to subject cataloguing.   (*In* Kaula (P N), *Ed*.   Library science today.   1962. Chapter G1).

16 Sec   734 GUPTA (B S S).   Preparation of feature heading and class index heading using computer. (Lib sc. 7; 1970; Paper R).

17 Sec   734 ——.   Program-package for a system for document finding. (Lib sc. 7; 1970; Paper H).

18 Sec   731 KAULA (P). Chain indexing. (Herald lib sc. 9; 1970; Article ZZB).

19 Sec   731 KORANNE (T N).   Role of chain procedure. (*In* Ranganathan (S R), *Ed*.   Depth classification and reference service and reference material.   1953. P. 123–6).

20 Sec   731 LEONOV (R A).   Chain procedure for the compilation of alphabetical subject index.   (Nauchtech inf. Series 2(1); 1970; 15–21).

21 Sec   731 MILLS (J).   Chain indexing. (*In* International Study Conference on Classification for Information Retrieval (Dorking) (1957).   Proceedings. 1957. P. 103–4).

22 Sec   731 ——.   Chain indexing and the Classified Catalogue. (Lib Assoc rec. 57; 1955; 141-8).

23 Sec   731 ——.   Indexing a classification scheme.   (Indexer. 2; 1960; 40–8).

24 Sec 731 MILLS (J). Use of chain procedure in constructing the alphabetical subject index for a classified catalogue. (*In* Piggott (Mary), *Ed.* Cataloguing principles and practice: An enquiry. 1954.   P 61–3).

25 Sec 731 NAGAR (M L). Chain Procedure and subject headings. (Ind lib 1; 1946; 36–43).

26 Sec 18 NEELAMEGHAN (A).   Sequence of component ideas in a subject. (Lib sc. 8; 1971; Paper Q).

27 Sec 25 ——. Trend of research in notational system for library classification, with particular reference to the Colon Classification. (Annual seminar, (DRTC). 9; 1971; Paper CH).

28 Sec 523 —— and BHATTACHARYYA (G). Chain procedure
        733 and micro subjects. (Lib sc. 5; 1968; Paper E).

29 Sec 523 —— and ——. Class index entries for micro documents; A case study. (Annual seminar, (DRTC). 5; 1967; Paper V).

30 Sec 731 PALMER (B I) and WELLS (A J). Fundamentals of library classification. 1951.

31 Sec 731 PARKHI (G R). Symbiosis between classification and catalogue. (*In* Kaula (P N), *Ed*, Library science to-day. 1962. Chap G2).

32 Sec 731 PASSI (N N). Subject indexing and Dr Ranganathan. (*In* Kaula (P N), *Ed.* Library science to-day. 1962. Chap G3).

33 Sec 731 PENDRILL (G R). Classification and subject cataloguing at the Royal College of Physicians of Edinburgh with special reference to the use of chain procedure indexing with the Barnard Classification. (Paper submitted to the International Congress of Medical Librarianship, 2, 1963).

34 Sec 731 RAMANANDA (B S).   Subject headings by chain procedure and classification. (Annual seminar, (DRTC). 5; 1967; Paper T).

35 Sec 731 RANGANATHAN (S R). Chain procedure and dictionary catalogue. (Ann lib sc. 1; 1954; 217-21).

36 Sec 71 ——. Classified catalogue code. 1934.

37 Sec 52 ——. ——. Ed 5. 1964.

38 Sec 22 ——. Colon classification. Ed 7: A preview. 1969.

39 Sec 18 ——. Hidden roots of classification. (Inf stor retr. 3; 1967; 399–410).

40 Sec   22 RANGANATHAN (S R). Prolegomena to library
            classification. Ed 3. 1967.
41 Sec 732 ——. Subject heading and document finding system
            (Annual seminar, DRTC. 7; 1969; 255–81).
42 Sec 732. ——. Subject heading and facet analysis. (J doc.
            20; 1964; 109–19).
43 Sec   72 ——. Theory of library catalogue. 1938.
44 Sec 731 STANDARDS (British — Institution). *Guide to the
            Universal decimal classification* (UDC). (B.S.
            1000 C; 1963) (FID No. 345).
45 Sec 731 SUBRAMANYAN (T V). Chain procedure and cyclic
            permutation of terms in class index   entry.
            (Annual seminar, (DRTC). 5; 1967; Paper U).
46 Sec 732 THOMPSON (A). Rules for subject headings etc.
            (J doc. 9; 1953; 169–74).
47 Sec 731 VICKERY (B C). Classification and indexing in
            science. Ed 2. 1959.
48 Sec 731 ——. Review of the *British national bibliography*,
            Jan-Mar, 1951, (J doc. 7; 1951; 258–62).
49 Sec 731 ——. Structure of connective index. (J doc. 6;
            1950; 140–51).
50 Sec 731 WELLS (A J). *British national bibliography*. (Ann.
            Lib sc. 4; 1957; 73–89).
51 Sec 731 ——. Some comments on the INB experimental
            fascicules. (Ind lib. 13; 1958; 9).