

## **COMPOUND SUBJECTS IN THE FIELD OF PHYSICS: A quantitative analysis of facets**

**M A Gopinath and G Ajith Kumar\*** *Documentation Research and Training Centre, Indian Statistical Institute, 31 Church Street, Bangalore 560001.*

Presents quantitative data on facet analysis of compound subjects in the field of Physics, published in Britain during the two time epochs 1961 and 1981. The data is analysed and consolidated on the basis of the following criteria for distribution of documents. 1) by major subjects in the universe of subjects. 2) by subclass of Physics. 3) by the number of facets in the compound subjects. 4) by fundamental categories (PMEST). 5) by speciators to compound facets. It has been found that the distribution pattern of facets in compound subjects in physics appears to be stable.

### **0 Introduction**

Developments in the universe of subjects have an impact on the design and development of classification schemes (2). During the last two decades developments in different subject field appears to be significant. To get an assessment of the developments in the universe of subjects we have to do quantitative analysis. In this paper we plan to analyse the developments in compound subjects in the field of Physics. Physics has been a subject field which is next only to Mathematics in relation to its changing structure. New developments in post war research in Physics in the developed countries as well as the developing countries like India show a considerable variations in the macro and micro structure of subjects.

### **1 Methodology**

In order to get a quantitative measure we have analysed the documents published in Britain during the two years 1961 and 1981. For this purpose we have scanned the annual volumes of the British National Bibliography for the respective years.

---

\* Student of DRTC course (1982-84).

The documents scanned and listed from BNB physics section were facet analysed by the postulational approach to classification suggested by S R Ranganathan (1).

## 2 Data Collection

The annual volumes of the British national bibliography for the years 1961 and 1981 were scanned and the entries in 530-539, Physics section were listed in separated slips. The main entries for books, conference proceedings and periodicals were found to be incident in this section. The total number of entries so collected was 760, of these 394 documents were published in 1961 and 366 documents were published in 1981. The subject of each of the main entries were identified by the title of the documents as well as by the subject headings associated with the entry. For example the following entry is a typical entry.

Example of Main entry:

532.051 072—Fluids. Flow. Analysis. Numerical methods.

Patankar S.V. Numerical heat transfer and fluid flow/Suhas V Patankar.—Washington; London: Hemisphere, (1980.—xiii, 197 p.; 111; 24 cm.—(Series in computational methods in Mechanics and Thermal sciences).

Bibliography: P 189-193.—Includer inderc. 1 SBNO-07-0487405; £ 13.50 B 81-04512.

*Expressive subjects in determined using*

Subject heading: Fluids. Mechanics.

532.051 072—Fluids. Flow Analysis. Numerical methods.

Raw title:

Numerical heat transfer and fluid flow  
and facet analysed into the following.

Analysed title:

Heat Physics (BS), Heat Energy (P)—in fluids (Sp to P):  
Transfer (E): Analysis (2E)—Numerical methods (Sp to 2E).

### 3 Consolidation of the data

The facet analysed subjects embodied in the documents were grouped in the following ways:

- (a) By the number of documents and by the number of facets incident in their subjects.
- (b) Quantitative scatter of documents in relation to Physics and canonical basic subjects in the field of Physics.
- (c) Quantitative scatter of documents according to manifestations of Personality, Matter, Energy, Space and Time and on anteriorising common isolates.
- (d) Consolidation of data on the speciators going with the different facets namely, Basic facet, Personality facet, Matter facet and Energy facet.

The succeeding sections of this paper presents detailed analysis of the condolidated data.

### 4 Data on documents

The annual volumes of BNB indicate publication of large number of documents. The following table presents data on the total number of documents listed in 1961 and 1981. It also lists the number of documents that are on Science and Technology and exclusively on Science, Technology and Physics.

**TABLE 1: Distribution of documents by subjects**

SN	Subjects	Number of documents			
		1961	Perc.	1981	Perc.
1.	All Subjects	20538		41033	
2.	Science and Technology	4824	23.5	9120	22.30
3.	Science	2088	10.2	3544	8.63
4.	Technology	2736	13.3	5576	13.60
5.	Physics	394	1.9	366	0.89

The publications of document per year has almost doubled during 1981 from that of 1961. The publications in Science and Technology has also doubled in the time epochs. But in Physics there

appears to be a decline in the publications. The relative percentage of documents published in Physics to overall number of documents also shows a decline.

### 5 Distribution of documents by canonical subjects and related subjects

To get an idea about the scatter of the subject in different canonical basic subjects, the data analysed were partitioned according to the first order sub divisions of Physics given in Colon Classification edition 7. But one exception was made that is, Mechanics was also included in the group of subjects. Further the documents scatter in relation to Space Physics and other main subjects were also listed.

The following table presents details on the scatter of subjects according to canonical divisions.

**TABLE 2: Distribution of Documents by subdivisions of Physics**

SN Name of canonical subdivisions	Number of documents	
	1961	1981
1. Gravitational theory	—	6
2. Electromagnetic theory	—	11
3. Quantum theory	9	13
4. Special theory of Relativity	2	9
5. Wave Mechanics	1	4
6. Properties of matter	5	4
7. Sound	5	3
8. Heat	13	8
9. Thermodynamics	6	2
10. Radiation	36	40
11. Electronics	17	5
12. Electricity and Magnetism	1	7
13. Electricity	25	21
14. Magnetism	11	9
15. Microphysics	146	62
16. Mechanics	67	41
17. Space Physics	1	—

SN	Name of canonical subdivisions	Number of documents	
		1961	1981
18.	Physics <i>Int</i> Chemistry	2	—
19.	Physics <i>Int</i> Engineering	2	1
20.	Physics <i>Int</i> Mathematics	10	—
21.	Physics <i>Int</i> Medicine	—	1
22.	General Physics	35	119

*Annotation:*

It is obvious from the above table that pattern of scatter of documents is more or less same in 1961 as well as 1981. The peak in both the cases is occupied by Micro Physics. It is 31 percent in 1961 and 17 percent in 1981. It indicates the post war studies in Physics is primarily in the area of Nuclear Physics. The second subject having a high incidence is Mechanics. It has an incidence of 17 percent in 1961 and 11 percent in 1981. The third in order is Radiation which has 9 percent in incidence in 1961 and 10.9 percent in 1981. Electricity, Electronics and Magnetism fall in the next sequence of descending incidences. Gravitational theory and Electromagnetic theory have appeared only in 1981. Physics in relation to other subjects such as Mathematics, Engineering, Chemistry and Medicine shows a decline in 1981 as against the incidences in 1961. While general Physics indicates a good incidence in 1981.

## 6 Distribution of documents according to number of facets

The facet analysis of compound subjects in the field of Physics indicates that there are documents of various depths — namely single faceted to nine faceted subjects. In order to get a closer analysis of quantum of incidences of subjects with different facet dimensions, we have consolidated data on the basis of the number of facets in different compound subjects in Physics. The following table presents the details.

**TABLE 3: Document scatter by number of facets**

SN	Number of Facets	Number of documents	
		1961	1981
1.	1	23	23
2.	2	49	101
3.	3	95	87
4.	4	104	94
5.	5	68	41
6.	6	27	15
7.	7	15	3
8.	8	9	2
9.	9	4	0

Note: Total number of documents analysed is 760.

*Annotation:*

The percentage of scatter of documents between one to five facets is fairly significant in both the years 1961 and 1981. However, there is a sharp decline of the percentage of documents in the case of six faceted to nine faceted subjects. This decline is more in the case of 1981 than in 1961. It may be observed that the data suggests a fall in the intensive study of ideas. The largest incidence of documents is in two faceted subjects in 1981 (namely 27.6%) whereas it is 4 faceted subjects in 1961 (namely 26.4%). However the range of subjects lying between 2 to 5 faceted dimension have the highest cluster of documents. This indicates that in the field of Physics the optimum depth of a compound subject as per facet dimension lies between 2 and 5 faceted subjects.

**7 Distribution of documents by fundamental categories of facets**

A variety of facets are incident in the compound subjects in the field of Physics. Therefore, it is helpful to know the frequency of incidences of these facets in different compound subjects. For this purpose, an analysis of manifestation of the fundamental categories Personality, Matter, Energy, Space and Time were made. The quantitative details of their incidences in the two epochs of time under study is presented in the following table.

**TABLE 4: Documents scatter by fundamental categories**

SN	Fundamental categories	Number of scatter	
		1961	1981
1.	Personality	346	246
2.	Matter	160	164
3.	Energy	155	67
4.	Space	5	3
5.	Time	5	4

Note: The manifestation of the fundamental categories may be incident in a compound subject more than once. Therefore, we may find that the total number of incidences is larger than the actual number of documents studied.

*Annotation:*

It is obvious that the Personality facet has got the highest incidence among the compound subjects in the field of Physics. It is approximately 50% of the total incidence in both the epochs of time. The Matter facet comes next in order but its percentage of incidence is higher in 1981. The incidence of Energy facet is also fairly high. But its incidence is more in 1961 (namely 23%) than in 1981 (namely 13.8%). The incidence of Space and Time facets appears to be significant in both the time epochs. The form facets indicated anteriorising common isolates is incident in a good measure in both the time epochs.

### 8 Incidences of speciators in facets

Incidence of speciators of facets indicates in depth developments within a facet. In order to assess the depth of a focus with in a facet, it is necessary to identify the speciators in each of the facets. The following table presents the distribution of the speciators to different facets.

**TABLE 5: Distribution of incidence of Speciators**

SN	Speciators to fundamental categories	Number of speciators	
		1961	1981
1.	Basic facet	7	7
2.	Personality	59	31
3.	Matter	10	10
4.	Energy	11	4

**Annotation :**

It is evident from the data presented in the table 5 that the pattern of incidence of speciators in both the time epochs is similar. Personality has the highest incidences of speciators (nearly 60% in 1981 and 68% in 1961). The next comes in order, speciators to the Matter facet which has slightly higher incidence in 1981. Incidence of speciators to Energy facet is more in 1961 whereas it is rather low in 1981. The Basic facet has also incidence of speciators such as Systems, Environment and Specials. But we did not find any incidence to speciators to Space or Time facets.

**9 Conclusion**

The quantitative data on facet analysis obtained for 1961 and 1981 indicate that there is greater concentration of property and action ideas reported in 1961. Whereas in 1981 we find greater concentration of studies on properties of Personality ideas. Thus from the point of view of quantitative analysis of facets the 1961 and 1981 data reflect that there is greater depth in facet dimension in the compound subjects in 1961 rather than that of 1981. This suggests that the development of schedules for classifying books in physics during the recent decades may not call for greater depth in facet analysis and synthesis.

**10 Bibliographical References**

1. RANGANATHAN (S R). *Classifying as translating*. (In *his Prolegomena to library classification* Ed. 3. 1967 Chapter SB).
2. RANGANATHAN (S R). *Impact of universe of subjects on scheme for classification*. (FID/CR report series No. 12). (Ranganathan memorial number) 1972.