Chapter 6

THE CAPACITY OF A LIBRARY CLASSIFICATION EMANCIPATION OF ORDINAL NUMBERS

Brevity is one of the qualities prescribed for classificatory language in category 53 of section 215 of chapter 2. The briefer the class numbers, the greater the convenience. The length of a class number is equivalent to the number of the digits making it up. If we remember that the numbers are all decimal fractions the number of digits needed to construct a number of given ordinal value will depend on the stock of digits we have at our disposal, that is on the number of digits which form the basis of the number-system — in other words, on the base of the notation. The longer the base of the notation, the briefer will be the numbers. This phenomenon is well known in Arithmetic.

61 Capacity for Class Numbers of Specified Length

The following table gives the number of specific subjects which can be given class numbers whose length is specified for different lengths of the base of notation:

Number of digits in Class Number	No. of digits in the Base of notation: 1	2	3	10	D
1	1	2	3	10	D
2	1	4	9	100	D^2
3	1	8	27	1,000	D^3
4	1	16	81	10,000	D^4
5	1	32	243	100,000	D^5
.	.	.	.	.	.
10	10	1,024	59,049	10,000,000,000	D^{10}
.	.	.	.	.	.
n	1	2^n	3^n	10^n	D^n

The number in each cell gives the number of specific subjects whose call numbers have the number of digits shown at the beginning of its row, when the number of digits in the base of notation is the number shown at the top of its column. If we denote the number of digits in the class number by n, the number of digits in the base of notation by D and the number of specific subjects in question *i.e.* the number of possible class numbers by $s\ (n, \mathrm{D})$, we have

$$s\ (n, \mathrm{D}) = \mathrm{D}^n$$

D^n is the measure of the capacity of class numbers with n digits, when the base of notation has D digits.

62 *Capacity for Class Numbers not Exceeding Specified Length*

The following table gives the number of specific subjects which can be represented by class numbers which do not contain more than a specified number of digits for different lengths of the base of notation.

No. of digits in the Base of notation

Upper limit for the Number of digits in Class Number	1	2	3	.	10	.	D
1	1	2	3	.	10	.	D
2	2	6	12	.	110	.	$\mathrm{D}^2+\mathrm{D}$
3	3	14	39	.	1,110	.	$\mathrm{D}^3+\mathrm{D}^2+\mathrm{D}$
4	4	30	120	.	11,110	.	$\mathrm{D}^4+\mathrm{D}^3+\mathrm{D}^2+\mathrm{D}$
5	5	62	363	.	111,110	.	$\frac{\mathrm{D}^6-\mathrm{D}}{\mathrm{D}-1}$
.	.	.	.		.	.	
10	10	2,046	88,572	.	11,111,111,110		$\frac{\mathrm{D}^{11}-\mathrm{D}}{\mathrm{D}-1}$
.	.	.	.		.	.	
n	n	$2^{n+1}-2$	$\frac{3^{n+1}-3}{2}$	.	$\frac{10^{n+1}-10}{9}$		$\frac{\mathrm{D}^{n+1}-\mathrm{D}}{\mathrm{D}-1}$

The number in each cell gives the number of specific subjects, the number of digits in whose class numbers does not exceed the number shown at the beginning of its row when the number of digits in the base of notation is the number shown at the top of its column. If we denote the maximum permissible number of digits in a class number by n, the number of digits in the base of notation by D, the number of specific subjects in question by C (n, D), we have

$$C(n, D) = \frac{D^{n+1} - D}{D - 1}$$

C may be called the capacity for the specified length of the base of notation and the specified upper limit to the length of class number.

The capacity of a library classification is thus a function of the number of basic digits it uses and the upper limit which it imposes on itself regarding the number of digits in its class numbers. From the point of view of capacity, a library classification is determined by these two numbers: D and n. This shows that there are two ways in which the capacity of a library classification can be increased *viz.* by increasing D or n. The table in 62 shows that increasing D by 1 increases the capacity more than increasing n by 1. Using the notation of Finite Differences

$$\frac{\Delta C}{\Delta D} > \frac{\Delta C}{\Delta n}$$

It can be conjectured from this that it will be an advantage to make D larger than n.

621 *Principle of Increasing Return*

The form of the function for the capacity of a library classification shows that the rate of its growth increases with D as well as n. Indeed it gallops with a tremendous acceleration. It is the Principle of Increasing Return that we meet with. This means that the addition of one extra digit to the base of notation increases the capacity tremendously if the base is already fairly long. The acceleration itself increases as D increases. Therefore the need or the desire to lengthen the base will be very meagre after the base has reached a certain length. The longer the base, the more meagre will be the need and the tendency to add even one extra digit to it. This will have a wholesome effect on classificationists.

63 *Upper Limit to* n

Various considerations suggest an upper limit to *n*, the number of digits in a class number.

631 *Books*

In the case of books, the class number has to be tooled on its spine or written on a tag affixed to it. The normal width of the spine of a book is about an inch. This suggests 10 or 12 as the upper limit for *n* and 5 or 6 would be convenient. There is an irony here. Compendious books which cover a large range of knowledge usually have a broader spine but call only for short numbers. It is the thinner books of the monograph type which deal intensively with a narrow range of knowledge that need long numbers. When Decimal Classification was designed, it was compendious books which were dominant and even with a small base of notation, it was possible to individualise most of the subjects embodied in books with class numbers of less than ten digits. But, of late there is a contraction in the range of knowledge embodied in books. Specialised books are increasing in number. This calls for the use of a longer base of notation in order to keep the number of digits in class numbers within bounds. It has been said that the joy brought to a grammarian by the saving of a fraction of a phoneme is as much as the birth of a son would bring. So it is with those engaged in designing schemes of classification. It is this urge which accounts for a long enough base of notation.

631 *A Warning*

There is another way in which some classificationists seek to satisfy this urge. That is to sacrifice the obligation to individualise a specific subject, in order to keep the length of class number within bounds. This results in assigning one and the same class number to a whole chain of distinct but subordinate classes — to give the same number to all of them as for their immediate universe *i.e.* the major class of which they are all subclasses. Of the two evils — the one of sacrificing individualisation and the other of admitting irritatingly long class numbers staring us in our face — it is desireable to tolerate the latter. In that case, the long class numbers will always be reminding us of their existence and we will be made to invent some more powerful notational devices to shorten the numbers. If we tolerate the former evil, there will be nothing visible to show that we had succumbed to an evil and to make us improve the capacity of the library classification. When one of two alternative evils must necesserily be accepted, we must use discretion in the choice. The epic *Ramayana* has a delightful episode to emphasise that wisdom lies in putting aside prestige and choosing that form of evil which shows explicitly and permanently the measure of our failure. In the war between the hero Rama and the anti-hero Ravana, Ravana who was prestige-ridden threw away all the dead bodies of his force into the sea. Rama did not do so. At the end of the war, a herb was brought into the battlefield by a medicine-man, the perfume of which revived all the fallen. Rama's men got up as from sleep; but, alas, the bodies of Ravana's men were not there to get the benefit. And so let us make the results of our short-comings stare us in our face and stimulate us to further effort.

632 *A Higher Limit for Documentation*

Apart from this warning that individualisation is paramount in classification and that it should not be sacrificed to shortness of notation, there is the fact that the length of class number crosses the comfortable limit more often in documentation than in book-arrangement. In documentation, the restriction imposed by the spinewidth of the book does not arise. Apart from the absence of this physical restriction, the mental resistance to long numbers is likely to be less in those who habitually seek and use documentation service. They will be men of higher calibre. They may tolerate longer numbers. A higher upper limit may, therefore, be allowed in documentation work for the number of digits in class numbers. In other words, the capacity of the library classification may be increased by increasing n rather than D in order to meet the demand of documentation.

64 *Emancipation of Ordinal Numbers*

The search for longer base of notation usually lands one on an alphabetical base. The change-over to such a base implies the unconscious acceptance of the letters of the alphabet as ordinal numbers. It implies also an unconscious acceptance that an ordinal number need not have a cardinal analogue. Unfortunately the traditional use of the same digits and words to denote cardinal and ordinal numbers had curtailed the freedom of the latter. The mathematician's pre-occupation with cardinal numbers had led to his neglect of ordinal numbers. One of the bye-products of the emergence of library classification as a discipline resulting in an artificial language of ordinal numbers is leading to a conscious emancipation of ordinal numbers. The base provided by the letters of the Roman alphabet has been used by the Colon Classification to lengthen the base provided by the Arabic numerals. In fact, the base of lower case letters is taken to be smaller in ordinal value and the base of capital letters to be greater than the base of the numerals. Making allowance for the omission of *i* and *o* which are inconvenient to use, the base of notation has thus been extended from 10 to 50. A statistical study of the length of class numbers recorded in section 5129 and its subdivisions of the *Library classification: Fundamentals and procedure* shows that this expansion of the base of notation has resulted in making the capacity of the Colon Classification reach with 5.3 only as the average number of digits in class numbers, the capacity which the Decimal Classification attains with 7.4 as the average number of digits in class numbers. It is able to individualise many more subjects by adding two more to the average number of digits and bringing it to 7.2 which is still less than that of the non-individualising Decimal Numbers.

641 *Connecting Symbols*

The emancipation of ordinal numbers from the thraldom of cardinal numbers leads to the emancipation of the base of notation from the thraldom of the traditional symbol groups. It provides freedom to take, wherever necessary, symbols from outside traditional groups and interpolate them in the base at the places where they are needed. We have already seen in chapter 2 that apart from substantives, conjunctions are needed to represent different kinds of relations. The Universal Decimal Classification has utilised, for this purpose, the result of the emancipation of ordinal numbers and introduced relation-signs like :, / . (.) " " and so on. It is true that it has not explicitly either called them ordinal numbers or defined their ordinal values. None the less, these are all implied in the notation of that classification. In the Colon Classification, the connective symbols are all deliberately conceived as ordinal numbers and their ordinally values are defined in exact terms.

642 *Peculiarity of Conjunctions*

It happens that all the ordinal numbers devised for connective purposes lie between 0 and 1. In the second edition, : and — were devised. In the forthcoming fourth edition, which is working out the details necessary to meet the requirements of documentation work, additional conjunctions are being introduced. They too lie between 0 and 1. Zero itself is only a conjunction in the Colon Language. From this it has to be conjectured that a digit which is a conjunction by itself or is the first digit of a conjunction is to have an ordinal value which is less than that of any digit which is a substantive.

Ranganathan, Shiyali Ramamrita.
Philosophy of Library Classification. First Indian Reprint 1989
Bangalore, Sarada Ranganathan Endowment for Library Science, 1989.

This is a title in the dLIST Classics Project

dLIST Editor-in-chief: Anita Coleman

Digitization: Joy Wilcox, SIRLS, University of Arizona, Tucson.
Digitized: Fall 2006

Acknowledgments: SRELS Foundation (A. Neelameghan, K.N. Prasad, K.S. Raghavan, DRTC) and dLIST Advisory Board Member, S. Arunachalam (MS Swaminathan Research Foundation)

dLIST Classics by S.R.Ranganathan:

Five Laws of Library Science, Ed. 1 (1931)
Philosophy of Library Classification, (1973)
Prologemena to Library Classification, Ed. 3, (1967)
Classification and Communication, (1951)
Documentation Genesis and Development, (1973)
Documentation and its Facets, (1963)
Library Book Selection, Ed. 2, (1966)
New education and school library: Experience of half a century, (1973)
Reference Service, Ed. 2, (1961)

Other dLIST Classics

S.R. Ranganathan's Postulates and Normative Principles: Applications in Specialized Databases Design, Indexing, and Retrieval, 1997. Compiled by A. Neelameghan
Memorablia Ranganathan: A compilation of useful quotations of S.R. Ranganthan from his various works, 1994.
Putting Knowledge to Work: An American View of the Five Laws of Library Science, 1970, Pauline Atherton.

Read the dLIST Classics online:

Digital Library of Information Science & Technology
http://dlist.sir.arizona.edu/