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Colon Classification (CC) * †

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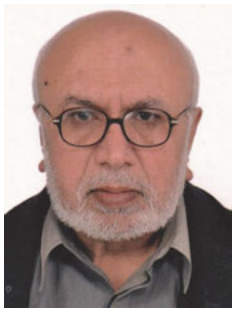

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Abstract: Shiyali Ramamrita Ranganathan (1892-1972) has been called the father of the Indian library movement. He developed the revolutionary *Colon Classification* (*CC*) from 1924 to 1928, which was published in seven editions from 1933 to 1987. In this article, the evolution of *CC* through its seven editions is discussed. The unique features of *CC* are described, including the work in idea, verbal, and notational planes. Tools for designing and evaluating a system are enshrined in his fifty-five canons, twenty-two principles, thirteen postulates, and ten devices (Indian Statistical Institute 2012, 34-38). Semantic and syntactic relations are enshrined in his order of main classes, Principles of Helpful Sequence in arrays, the PMEST facet formula fitted with rounds and levels of facets, and other principles, such as the famous wall-picture principle for citation order of facets, and numerous devices for improvising class numbers for nonexistent isolates and potential subjects. Briefly explained are facet and phase analyses and number building with its notational base of seventy-four characters and symbols. The entry concludes with a discussion of the extent of application of *CC* in libraries, its contribution to the science of classification, and a view of its future.

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1.0 Introduction

Mathematician turned librarian Dr. S. R. Ranganathan (1892-1972) is deservedly called the father of the Indian library movement. Internationally recognized as the most prolific library thinker and innovative librarian of his time, his exemplary dedication and uncanny insights won him the acclaim of his peers the world over. His work forms the bedrock of an influential theory of the wide discipline of knowledge organization. His extensive work on all aspects of library science was epoch-making, and created a paradigm next in importance only to the pio-

neering work of Melvil Dewey (1851-1931), who is often considered the father of modern librarianship. Ranganathan's views, appeals, and the research findings he communicated through books, journals, reports, international seminars, and lectures, have pervaded, and still constitute, the core of our current knowledge of the subject. His books, on almost all branches of library and information science, are librarians' lore. This article focuses on his *Colon Classification* (*CC*)[1] and does not cover facet classification in general, or the biography of Ranganathan, as other entries in the encyclopedia are planned for these topics.

2.0 A brief history of the editions of *Colon Classification*

The *Colon Classification* (*CC*), conceived and initially developed from 1924 to 1928, and initially applied in the Madras University Library, was first published in 1933 (Ranganathan 1933) by the Madras Library Association (founded by Ranganathan in 1928). The latest edition, and the first published after the death of Ranganathan, was the seventh (Ranganathan 1987). Being a mathematician and a close student of an inspiring teacher W. C. B. Sayers (1881–1960) in the School of Librarianship, University College London, Ranganathan was most attracted to classification studies. In his later work, he perceived many similarities between classification and mathematics (Ranganathan, 1939b). At the same time, practical classification by the *Dewey Decimal Classification* (*DDC*) did not satisfy his orderly mind. That being a "mark and park" system without any professed theory, he could assign more than one class number to a document, especially those dealing with compound and complex subjects. For example, "Anatomy of flowering plants" could either be given the class number of "Plant anatomy" or "Botany of flowering plants." It was a problematic option by default for all such compound subjects. In his view, this defeated the purpose of classification itself. Besides this, Ranganathan also found only a nominal representation of Indian subjects in the scheme. WASPish (white, Anglo-Saxon, protestant) bias in Dewey's system, as it is in other western systems, is well-known, even today (Comaromi and Satija 1985). Indeed all knowledge organization (KO) systems are cultural and temporal in their making (Judge 1983; Sahadath 2013); (we shall return to this principal cultural bias in the conclusion, section 5.3).

First, Ranganathan realized that the aftermath of World War I, 1914-1919, had brought in the emergence of specialized, micro, and interdisciplinary subjects, which the existing classifications failed to cope with. He diagnosed that *DDC*, because of its enumerative nature and seventeenth century roots, was a classification suited to the nineteenth-century linear, mono-dimensional kind of literature (cf., Ranganathan 1961, 81-83). An enumerative classification by default is not hospitable to assigning coextensive class numbers to most compound and complex subjects except to some by coincidence (Parrochia and Neuville 2013, 14). Knowing the malady, the remedy could not have been far away. The problem occupied his mind relentlessly. In 1924, Ranganathan happened to visit Selfridge's department store in London, and accidentally stumbled on a demonstration of a Meccano toy kit. The salesman was making different toys from the same kit by permutation and combination of the blocks, strips, nuts, and bolts. That triggered his mind to adopt a similar technique to design different class numbers from the same subject concepts to suit individual documents (Indian Statistical Institute 2012)[2]. This idea later brought a paradigm shift in classification theory, practice, and research. He visualized that all knowledge is comprised of some basic and discrete concepts (call these building blocks of the universe of knowledge), which could be combined to construct class numbers to specifically suit a document, instead of assigning it a predetermined ready-made sort of pigeonhole class number. Connecting symbols in the form of punctuation marks served as his nuts and bolts to string together discrete concepts. Sayers at once commended the idea of the new technique, but warned him of the labour and patience required for the huge task ahead (Maltby 1975, 191). Back home in 1925, as the first trained librarian of Madras University, he developed and applied his scheme to that library, and gained long and first-hand experience of its applications and problems, including comments from the library's users. As already stated, *CC* was first published in 1933. The second edition (Ranganathan 1939a), was important as it clearly laid down the theory and methods of *CC* as already published in his magnum opus, the *Prolegomena to Library Classification* (Ranganathan 1937). The third edition of *CC* (Ranganathan 1950) came out when Ranganathan had moved to Delhi University and was in the second phase of his writing career. In Delhi, he attracted a band of young and faithful follower librarians and organized them into a formal group named the Library Research Circle; they considerably advanced research in classification, and applied his KO systems and methods in their libraries (Parthasarthy 1952). *Colon Classification* was widely adopted in Delhi libraries. This led him to delve into his classification theory at a somewhat more abstract level with his colleagues, disciples and students. New advances were published in conference volumes and serials of the Indian Library Association of which he was the president (1944-1953). After long experience and a constant quest to generalize the various facets, in 1952 he came out with his famous, although debatable, theory of "five and only five fundamental categories in the universe of knowledge." In

the earlier editions, the facets were named variously in different main classes, e.g., problem facet, institution facet, substance facet, etc. (Ranganathan 1939, 1.85-1.151). In the fourth edition (Ranganathan 1952) these were highly generalized by an intuitive process of abstraction, and named as personality, matter, energy, space, and time, famously known as PMEST[3]. It was a masterstroke in generalizing myriads facets to a few seminal categories[4]. It is considered to be the least number of categories for any bibliographic classification postulated so far. The fifth edition (Ranganathan 1957a) was proposed as two volumes of basic and depth versions, but only the basic version was published. Later Ranganathan realized the non-viability of publishing depth schedules in book form (Indian Statistical Institute 2012). By the time the sixth edition was published (Ranganathan 1960), *CC* had reached its pinnacle of glory, exemplified by the International Study Conference on Classification Study and Information Retrieval, held at Dorking, England in 1957, which exclusively discussed his theories with wide approval. The Classification Research Group (CRG) London formed in 1952, declared its manifesto of faceted classification as the basis of all future information retrieval systems. Ranganathan's philosophy and method of facet analysis achieved wide acceptance, though only a few believed the doctrine of five fundamental categories. The term facet was used differently by different scholars and classification schemes, and it still continues to be so used. The sixth edition, later issued with amendments (Ranganathan 1963), remains the most popular, used and stable edition. It is the one taught in all Indian library schools. The seventh edition (Ranganathan 1987), which was published posthumously and edited by his long-time research assistant, Professor M.A. Gopinath (1940-2013), was considered by many to be confused and inconsistent in structure and notation. On the whole, this edition has been discarded by the Indian library profession (Satija 1990). Nevertheless, it brought many metamorphic changes to aspects such as basic subjects, categories, common isolates, and notation, though to no avail.

3.0 Three versions of *Colon Classification*

Gopinath (1972) conveniently grouped the seven editions into three versions in the line of evolution of facetisation of the system.

3.1 Version 1 (1933–1950): rigidly faceted era

During this period, the facet formula was rigid and predetermined. The colon was the only connecting symbol for all the facets. That is, until the fourth edition (Ranganathan 1952) the only connecting symbol was the colon; even the absent facets had to be indicated by dummy colons, e.g., 2::::N for "libraries in twentieth century." Here the first three colons indicate the absence of matter, energy and space facets, the last colon is the connecting symbol for the time facet, i.e., twentieth century. It made the class numbers unwieldy and even slippery. An inadvertent extra colon could land the book in an alien place, thus misplacing it. Some adversaries made fun of the cluttering of colons.

3.2 Version 2 (1950–1963): analytico-synthetic Era

As stated earlier, the fourth edition became a milestone, with the postulation of the five fundamental categories and generalization of them concretely as PMEST. Each category was indicated by a distinct connecting symbol. Hence, the absence or presence of any category was self-, or automatically indicated. For example, the class number above is now denoted as 2'N—the apostrophe being the indicator symbol for the category of time. It means that all other categories, namely P, M, E, and S are visibly absent. It brought simplicity and brevity to the notation by doing away with the rigidity of the facet formula.

3.3 Version 3 (1963–1987): freely faceted era

This period was devoted to the close study of the properties and structure of the universe of subjects. The matter category was split into three sub-categories: matter-property, matter-method and matter-material. Discovery of new common isolates, the concept of speciators to further differentiate a facet into species, and the development of highly hospitable sector notation and devices for improvising class numbers made *CC* more flexible. This led Ranganathan to declare it as a freely-faceted analytico-synthetic scheme, which is a sort of a self-perpetuating system. A self-perpetuating system is one that needs least revision, and which allows forging of new isolates as needed with the help of inbuilt devices. The new version has a virtually infinite capacity to incorporate new subjects at their proper places with the help of hospitality devices for the creation of new isolate numbers. However, even though *CC* is a truly postulate-based analytico-synthetic classification, and a highly-faceted classification, history has proved that no classification can be self-perpetuating. The theory or concept of a self-perpetuating KO system is flawed.

4.0 Features of *CC*

The *CC* is a general scheme, which aims to classify by discipline (a method adopted and perpetuated by *DDC*) all subjects and all forms of library documents—books, periodicals, reports, pamphlets, microforms, and elec-

tronic media—in all kinds of libraries. For bibliographic records and micro-subjects, requiring depth classification, its potential becomes even greater. The scheme is described as an analytico-synthetic[5] as opposed to an enumerative classification system. Enumerative systems provide an exhaustive top down list of all subjects recorded at a given time. In contrast, the *CC* system lists concepts which are to be combined in a pre-set order, to construct a class number co-extensive with the subject of the document. This objectively[6] formulated and dynamic theory for designing and evaluating classification systems is enshrined comprehensively in his magnum opus *Prolegomena to Library Classification* (1937, 1957a, 1967a), and later summarized in a paper (Ranganathan 1964). For designing a classification system, Ranganathan divided the whole work into three successive planes, named idea, verbal and notational planes[7]. The idea plane is the message, the verbal its expression, and the notational plane is its visible representation in shorthand symbols.

4.1 Three planes of work

Prior to Ranganathan, classification design was considered an intuitive field, the domain of a few inspired geniuses. This is quite obvious from the work of Melvil Dewey (1851-1931), C. A. Cutter (1837-1903), and J. D. Brown (1862-1914). H. E. Bliss (1870-1955), who was singularly dedicated to classification studies, did base his *Bibliographic Classification* (1944-1953) on some concretely formulated principles which Ranganathan viewed as static theory. The first edition of *CC* was mostly based on intuition and unstated principles. Later he justified this approach by his belief that in the real world a practice precedes its theory: poetry emerged much earlier than poetics (Satija 1992, 87-88). To elaborate in his own words (Ranganathan 1961, 79-80):

> Design work of any kind has to draw largely from intuition unmediated as far as possible by the intellect or by rules framed by intellect. In its general makeup, a scheme of library classification will have to come out whole as an egg from the intuition of a classificationist of the creative variety. The intellectual classificationist can only polish it with the aid of a theory germane to it.

Nevertheless, Ranganathan soon crystallized the unconscious theory that had gone into the making of his *CC* from 1928 to 1933. This theory was precipitated in his magnum opus, *Prolegomena to Library Classification* (1937). Through comparative approach and by identifying the best practices in existing systems, he formulated a panoply of canons and postulates for designing and evaluating classification systems. Structuring his theory into canons was obviously borrowed from Sayers, whom he always regarded as the first grammarian of library classification (Ranganathan 1961, 76). In 1950, a great breakthrough was achieved in the design of classification by dividing it in three succeeding phases, called planes: idea plane, verbal plane, and notational plane. Guided by basic laws of thinking and the overarching Five Laws of Library Science (1931) the work in each plane is executed by a total of fifty-five canons, twenty-two principles, and thirteen postulates. Ranganathan (1967a, 53-71) makes clear distinctions between these terms. In addition, there are ten devices to improvise notations for non-existing concepts or terms in the schedules.

4.1.1 Idea plane

It is a thinking, policy, and decision-making phase; a paramount plane which is both a map and foundation of the system's design. The quality of work done here genetically determines the quality of the ultimate product. Here intellectual analysis of the subject is done; characteristics are selected to break down the subject of the document into facets, and ultimately into isolates, arranged discretely and systematically into arrays and chains. An isolate is the smallest unit of knowledge in *CC*; whereas a facet is a group of isolates, denoted by an umbrella term, obtained by the application of a single characteristic to a set of entities. The types and quality of characteristics, and the order in which these are to be applied, are determined by the seven Canons of Characteristics. These canons mandate that characteristics chosen as the basis of division should be able to divide, and be relevant to the ultimate purpose of classification, objective, and permanent; characteristics should be applied in order of general to specific and one by one in proximate steps.

Once facets and their isolates are formed by the application of characteristics, the function of the next set of canons is to arrange terms in arrays and chains. An array is a set of cognate entities of equal rank arranged in some systematic and predictable order. For this, Ranganathan formulated rules for formation of arrays of entities. These are: Canon of Exhaustiveness that an array should be inclusive of all the classes. Canon of Exclusiveness lays down that an entity should belong to one and only one array—it will avoid cross classification. This is only required for shelf classification as for classifying databases and designing Online Public Access Catalogs (OPACs), cross classification is a boon. Cross classification allows a virtual document to be kept at more than one place. Helpful Sequence canon means that facets and isolates of an array should be arranged in a predetermined logical or utilitarian sequence, or the one which is expected by the majority of the users. Historical events should be arranged chronologi-

cally, while United Nations member states can be in an alphabetical order; living species may be arrayed in the order of their evolution (Principle of increasing complexity); chemical elements can be arranged by their atomic numbers. Coins can be arranged by their face value. Geographical entities can be arranged by the principle of spatial contiguity, as in a map. Ranganathan discovered eight options to arrange entities in a helpful order. A chain is a sequence of entities in a constantly decreasing order of their extension. For example, World—Asia—South Asia—India—North India—Delhi is a chain of classes. The Canon of Decreasing Extension means a chain should move from broader to narrower or from general to specific classes; and the Canon of Modulation means no link in the chain should be missed. Division of a universe should be gradual, proximate and finely calibrated. In the chain above, we should not jump from India to Delhi omitting North India. At the end of the work here we have a finely woven and exhaustive systematic network of all concepts with nodes and links. But still all is nebulous, and in an intangible and amorphous form.

4.1.2 Verbal plane

Then the theatre moves to the verbal plane—to articulate the findings of the idea plane in unambiguous language. Language is the dress of thought, aptly said Samuel Johnson (1709–1784). Ranganathan (1962, Sec.A1) believed this and always exhorted librarians to learn to use technical terminology for effective communication. Terms used to express a science, or a phenomenon, should be current and free of homonyms and synonyms. Ranganathan vehemently laid down that terms used for a classification system should be made free of homonyms and synonyms; that is a term must be unique to the concept, and should be expressed and read in context. He also said that the terms should mostly be neutral, not opinionated or critical, meaning that a classification term should not be value-ridden. As an example, classification systems should not use the terms major or minor authors to categorize them, as *DDC* did in its 14th edition (1942). Ironically, the terminology in the *CC* is now quite dated, which poses problems in chain indexing—a famous system invented by Ranganathan to derive subject headings from class numbers.

4.1.3 Notational plane

Of the three planes, the notational plane is the most visible, so much so that many people mistake it for the classification *per se*. Ranganathan expected much from a notational system in terms of its capacity and sophisticated multitasking to represent complex ideas. He vainly aspired that the notation should faithfully and comprehensively translate the subject of a document into a language of ordinal symbols. For him, classification was also a sort of translation. He overloaded his notation with onerous work and expected it to be very powerful, but relegated it to be the servant of the idea plane. In fact, it is the faithful executor of the idea plane. However, he laid down that notation in a class number should be brief, simple and easy to write, remember (for a short time), and pronounce. These are optional qualities, not present in his system. More essentially, it should be expressive of subject structure (both hierarchical and faceted), and above all it should be hospitable to new subjects. This latter quality in Ranganathan's notation is in abundance—achieved at the high price of being unwieldy and too complex. Considered a high-water mark in the development of library classification notations, his notation is highly mixed and uses decimal, sector, and group notation. It is rigorously hierarchical, extremely hospitable and depicts the facets and categories in a transparent manner. His notation is highly mnemonic even down to the seminal level—e.g., unity, God, world, are always denoted by 1; diseases and mechanical breakdown will get the same number, as will medical cures and mechanical repairs in their different main classes. As another example, G;3, I;3; K;3, and L;3 represent general, plant, animal, and human physiology, respectively. Similarly, fuel/energy (machines), feed (animals), and food (humans) may get the same number wherever they occur in different schedules. Ultimately the notational plane is frighteningly complex and was much ahead of its time for shelf classification. Nevertheless, it is quite suited to computerized databases where the notational complexity does not matter.

4.2 Notation

The notation in *CC*-7, comprising seventy-four symbols and characters (sixty semantic and fourteen indicator) has been divided into the following six species (Ranganathan 1987, 33):

1	A/Z (Roman capitals)	26
2	Δ (Greek Delta)	01
3	0/9 Indo-Arabic numerals used decimally	10
4	a/z Roman lower case (i,l,o excluded)	23
5	* " ← Indicator symbols with anteriorising value	03
6	& ' . : ; , - = → + ( ) Ordinary indicator symbols	11 = 74

Asterisk, double inverted comma, backward arrow, ampersand, inverted comma, dot, colon, semicolon, comma, hyphen, equal to, forward arrow, plus, and parentheses (composed of two digits), respectively.

The notational base of *CC* is the widest ever in any library classification system. On this count, the *CC*-7 nota-

tion is wide based, thus very spacious and accommodating, though it has made the notation, and consequently the system, quite complicated—which has become detrimental to its popularity.

4.3 Division of knowledge in *CC*

The *CC* presumes the entire body of knowledge woven into a system, and considers there to be an evolutionary unity in it. All knowledge is one, Ranganathan learnt from the Vedas (1700-500 BCE). The structure that ultimately emerges from *CC* is both traditional and revolutionary at once. But in the end it is not Vedic or Eastern in its appearance or working. The fact that Ranganathan recognizes and uses the existence of time-honored main and canonical classes, makes his scheme look steeped in the Western disciplinary tradition going back to Francis Bacon (1561-1626). Ranganathan identified three types of subjects in the universe of knowledge: basic, compound and complex, analogous to chemical substances. Basic subjects are unitary subjects, such as physics, thermodynamics, economics, Marxian economics, homeopathic medicine, music, law, and library science. Compound subjects are basic subjects with subdivisions or additional facets, e.g., velocity of light, transport economics, guitar music, or law of marriage, and libraries in India. Compound subjects of varying degree are virtually infinite in number. Complex subjects are mostly interdisciplinary in nature, e.g., mathematics for engineers, geophysics, medical geography, or comparative physiology. Ranganathan postulated that every subject, be it of any type or level, has a basic subject that forms the first, or the base, facet in constructing a class number. *CC* further divides basic subjects into:

Main basic subjects
Non-main basic subjects

and further divided them into ten species. On the basis of their modes of formation the following ten types of basic subjects have been identified (Satija et al 2014):

1.	Main basic subjects	2.	Non-main basic subjects
1.1	Traditional (Law, Physics)	2.1	Canonical classes (Algebra, Geometry)
1.2	Newly emerging (Library & Inf. Sc.)	2.2	System constituents (Marxian economy)
1.3	Fused (Biotechnology)	2.3	Environment constituents (Desert farming)
1.4	Distilled (Research methodology)	2.4	Special constituents (Gerontology)
1.5	Subject bundles (Ocean sciences)		
1.6	Agglomerates (Social sciences)		

4.3.1 Complex subjects

A complex subject is a two-phased subject depicting mostly interdisciplinary relations. Six types of phase relations have been identified:

Type	Indicator digits	Example	Class number
General	a	Relation of political science with history	V &aW
Bias	b	Psychology for doctors	S & b L
Comparison	c	Physics compared with chemistry	C & c E
Difference	d	Difference between Christianity and Islam	Q, 6 & d7
Tool	e	Mathematical physics	C & e B
Influencing	g	Influence of Mahatma Gandhi on John Lennon	NR,56,N"w N40 & g zG

These relations can occur at three levels, namely: between two main classes for interdisciplinary subjects (e.g., phase relation: chemistry and physics); between two foci of the same facet (e.g., intra-facet relation: Islam and Judaism); and between two isolates of the same array within a facet (intra-array relation: Catholics and Protestants). Therefore, there are $6 \times 3 = 18$ such relations in all. The number of relations does not seem comprehensive, but it should be noted that phase relations supplement other relationships depicted through PMEST, citation order, hierarchy, and helpful-sequence principles (Satija 2001). The general phase relation comprehends any relationship not expressed through the other five, while other relations are obvious. Definitive rules for primary and secondary phases and constructing their class numbers ensure the expression of the relationships in a mathematically precise and consistent way (Ranganathan 1987, 33). Ampersand "&" is the indicator symbol for phase relation, while each of the eighteen relations has its own indicator symbol a/y.

4.3.2 Main classes and their order

Knowledge is the librarian's merchandise, our stock-in-trade. Understanding its nature and manner of growth is as vital to a classificationist as is the study of anatomy to a surgeon. Ranganathan's research in social epistemology

has been lauded as an everlasting "intellectual contribution to the underlying philosophy of librarianship" by the late Jesse H. Shera (1903-1982) (Shera 1970, 106). Ranganathan made pioneering studies of the mode of growth of subjects, mostly to attune his system to the growing universe of knowledge. He laid great emphasis on the order of knowledge and consequently on the arrangement of basic subjects in his *CC*. For him, the essence of library classification lay first in systematic arrangement, then in a helpful sequence of subjects and documents. A classification must depict the structure of knowledge. The first division of knowledge in *CC* is into traditional disciplines, which he arranges in the order of their evolution as academic studies, namely:

Science and technology
Humanities
Social sciences

The social sciences are the most recent academic disciplines to emerge; science and technology, however, were studies (of curiosity) of even primitive and cave-dwelling humans.

The disciplines are further divided into sub-disciplines, namely:

B*Z	Maths and physical sciences
G*Z	Biosciences
K*Z	Animal sciences
L*Z	Medical sciences
MZ*Z MZ*ZZ	Humanities and social sciences Humanities
S*Z	Behavioral sciences
T*Z	Social sciences

Within each discipline *CC* has an order of main classes meticulously based on objectively stated principles. An overview of main classes in the *CC* is as follows:

A/B Science/Mathematics	Δ Spiritual experience & Mysticism
C/D Physics/Engineering	N/O/P Fine arts/Literature/Language
E/F Chemistry/Chemical technology	Q/R Religion/Philosophy
G/H Biology/Geology	S/T Psychology/Education
I/J/K/L Botany/ Agriculture/Zoology/ Medicine	U/V Geography/History
	W/X Political Science/Economics
M Useful arts	Y/Z Sociology/Law

These main classes are in fact preceded by Generalia and Form classes a/z, and newly emerging classes 1/9, e.g.:

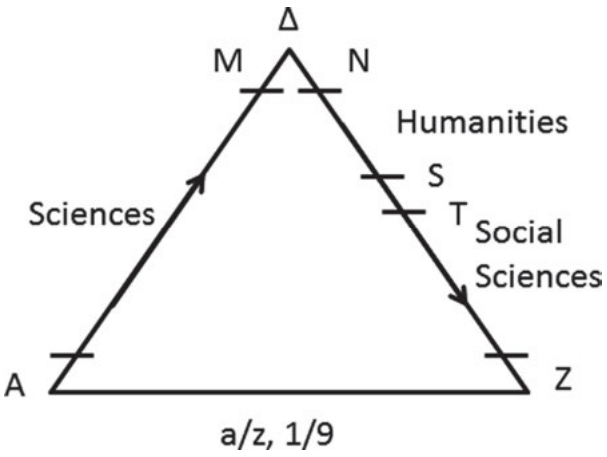
a Bibliography	1 Universe of knowledge
k General encyclopedias	2 Library science
m General periodicals	3 Book science
p Conference proceedings	4 Mass communication
w Biographies	8 Management science
z Generalia classes	

Sciences (including technologies) in classes A-M have been arranged in order of their increasing concreteness: B, Mathematics, is the most abstract of the sciences, while M, Useful arts, which includes crafts and applied technologies, is the most concrete in the group. Within A/M, theory and practice alternate: theory always precedes practice or its applications. For example, B, Mathematics, precedes C, Physics, which in turn precedes D, Engineering. E, Chemistry precedes F, Chemical technology. Similarly, I, Botany is followed by J, Agriculture. This internal arrangement is based on the principle of dependency, first promulgated by Auguste Comte (1798–1857). Unlike Dewey, Ranganathan preferred to collocate the theory with the practice of a subject. Indeed, the Library of Congress *Classification* (1899/1940+) followed this principle prior to Ranganathan. In the humanities, which are spread over main classes N-S, the arrangement is in order of increasing richness of subject content. The order of social sciences, in main classes T-Z, is of increasing artificiality of their laws: Z Laws, being legislative and subject to frequent modifications, is considered the most artificial of the social sciences. One may fault this arrangement. For example, economic and social laws are not artificial but are based on long observed human nature and thus should not come so far down in the order of classes.

In an article published prior to the release of CC, R.S. Parkhi (1933, 87) commended and explained its arrangement of main classes as logical and evolutionary. Elucidating his viewpoint, he described the Generalia class as the complete miniaturized view of knowledge that precedes the entire universe of knowledge. B Mathematics pervades every science, indeed the queen of sciences. Physical sciences C-F study the matter and forces that constitute this universe. G, Biology is vital science. Classes H-K are in evolutionary order of life on our planet. Classes L-P are application subjects for the well-being and prosperity of humankind. Classes from Q, Religion to T, Education are for the moral and social development of individuals, which in fact depend upon the correct application of classes L-P, which in turn depend on classes A-K. Classes U-Z study the geographical and social sciences, the latest areas of knowledge to engage

academicians. Here W Politics (and Government) precedes the creation and distribution of wealth in X, Economics, while Y, Sociology, and Z, Law keep society internally safe, intact and sustainable.

4.3.3 Triangular representation of main classes



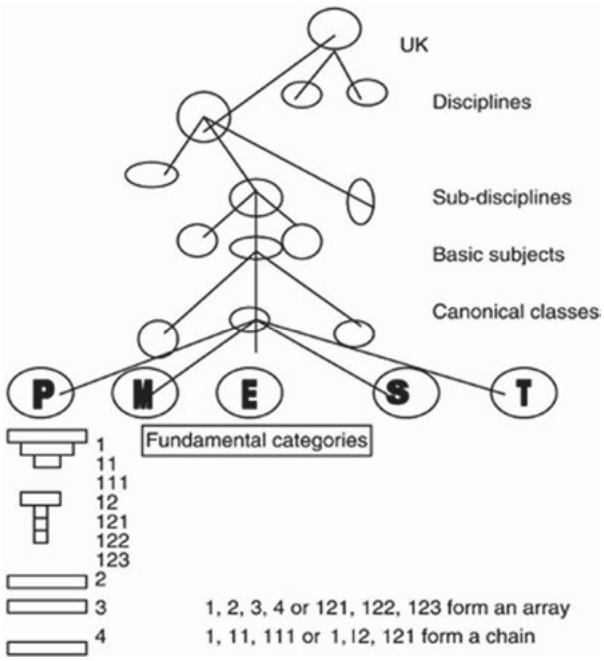
CC subsequently added the main class Δ (Greek letter Delta), Spiritual experience and mysticism, positioned between the sciences on the one hand and the humanities and social sciences on the other side of the triangle. The Δ is at the confluence of two different streams of knowledge, the sciences, and the humanities, the two different cultures of C. P. Snow (1905-1980). Ranganathan, (who personally believed in many supernatural phenomena and extra-sensory existents (Yogesawar 2001, 219-224)) treats spiritual experience as the fountainhead and summation of all knowledge, thus refuting Snow's theory of two cultures of sciences and humanities.

The library philosopher and classificationist H.E. Bliss (1870-1955) endeavored to discover a permanent order of main classes based upon what he called scientific and educational consensus. In fact, no consensus can ever be permanent, since knowledge is a socially created and driven entity. Therefore, there cannot be any pre-existing order of main classes in Nature**.** The spatial order of subjects and their social value varies from society to society and from time to time. It has very aptly been observed that we "have to replace continually a classification by another one, according to the perception of more basic links between objects, and to the discovery of new indices of classification in the course of time" (Parrochia and Neuville 2013, 18). The Renaissance placed a premium on humanities, while the Industrial Revolution gave the prime place to science and technology. In the nineteenth century theology was the queen of academic subjects only to be dethroned by research trends post the two World Wars. In the classification system of the Soviet Union (BBK), Marxism was given the first place in any division of knowledge. Ranganathan based his order instead on concrete and objectively stated principles. These principles are helpful in placing ever-emerging new main classes at their logically apt places in the array of main classes. The number of basic subjects has increased to about eight hundred in *CC*-7 without any problem of getting them to their rightful place in the lengthy array of basic subjects (Ranganathan 1987, 57-66).

4.3.4 Division of a main class

A main class is further split into [P], [M], and [E] categories, whereas categories of [S] and [T] are common to all the subjects in the universe of knowledge. Categories are further instantiated into facets, and facets into the ultimate isolates specific to that class. Very traditional main classes are divided into canonical classes, not directly into categories. Obviously canonical classes are traditional or classic divisions of an old main class. For example, mathematics has been divided into the canonical classes of arithmetic, algebra, geometry, etc., whereas physics divides into heat, light, sound, electricity, etc. Canonical classes of a main class have their own facets and isolates. Some of the main classes have systems, specials, and environmental main classes. These amplified basic classes precede the categories as the basic facet in the facet formula.

4.3.5 Division of the universe of knowledge (UK)



It may be noted that Ranganathan is very traditional in the division of knowledge up to the canonical classes.

4.3.6 Facet analysis

Facet analysis as developed by Ranganathan is at the core of *CC* philosophy and methods. Class numbers for compound or complex subjects are not listed ready-made. These have to be synthesized, or tailor-made, on the basis of the specific subject of the document. Ranganathan has given eight standard and interlocking steps to turn a raw title (as it appears on the document) into a coextensive class number based on the subject content and form of the document (Ranganathan 1987, 14-18). First of all, the specific subject of a document has to be determined. Ranganathan (1967a, 174) defines the specific subject of a document as the one whose extension and intension are square with its subject content, but does not outline practical procedure for its determination. Ranganathan calls it an intuitive or trial-and-error act for which there can be no specific rules. Indeed, it requires flair, and is learned continuously from experience. Nevertheless, a specific subject is to be determined from the title, subtitle, preface, table of contents, or even by reading the text, as when applying other knowledge organization systems (Koford 2017,10). The raw title may be augmented by key words or phrases, if necessary, to fully indicate the specific subject of the document.

Next, the subject proper must be separated from the common isolates, which represent the tangible bibliographic elements of the document, or viewpoint of the author. Then the main class in which the specific subject falls is determined. Main classes and other basic classes are postulated by the system—these are the givens, not to be challenged by a classifier. Ranganathan postulates that every subject belongs to one and only one basic subject, which forms the first facet (Ranganathan 1960, Sec.12, p.1.42). Then starts the facet analysis *per se* into PMEST categories. The system suggests identification and separation of the categories in a subject in the order from [T] to [P], moving from the easiest category to the most elusive one. Broader categories are further resolved into specific facets.

Categories tend to evade definition. Their nature is somewhat elusive, though not metaphysical. These are still postulated and require much experience and flair to recognize them. For example, the personality category occurs in all the main classes, yet it is difficult to say what in general it is. The nature or constituents of categories vary from main class to main class. Their deceptive nature is clear from the fact that what had been the energy category in the fourth to sixth editions became, all of a sudden, the matter category in the seventh edition. At times it is utterly confusing to categorize an entity clearly. For example, in the class music, musical instruments such as guitar, drum, flute, etc., are designated as matter category, so are books and other documents in library science. Therefore, if something puzzles us, the only solace seems to acquiesce in the way desired by Ranganathan. The Postulate of Impersonation of categories adds to the confusion—that is, a category may masquerade as some other category, e.g., a country is [P] in N Fine arts, V History and Z Law, but [S] in other social sciences. Also the context changes the category: Gold is [M] in numismatics but [P] in E Chemistry and HZ Mineralogy. In practical classification we start with identifying [T] and come down to [P] via [S], [E] and [M]. Time indicated by the apostrophe, is chronological, diurnal, or seasonal. Its examples are twentieth century, medieval period, summer season, or morning time, etc. Space indicated by a dot is the manifestation of geographical and political areas or population clusters, for example, Asia, London, French speaking countries, NATO, G-8, hilly or desert areas, Iberian Peninsula, or Colorado valley. Energy, indicated by a colon, manifests actions, activities, processes, and problems. For example, treatment, storage, diseases, teaching, management, or grammar, etc. are instances of energy. Earlier [M] was confined to the material of the entity, such as wooden chairs, marble sculpture, or gold coins. In the latest edition Ranganathan has widened the scope of matter by recognizing three variants of this category:

Matter-Property [M-P].
Matter-Method [M-M].
Matter-Material [M-Mt].

For all three the indicator symbol is ";" semicolon. Of all the fundamental categories, personality [P] is the most concrete, but, paradoxically, the most difficult to recognize. Like human personality it is a complex entity and thus elusive. Ranganathan recommended the Residual Method to spot it in the facet analysis of a subject. It means that after identifying [T], [S], [E], and [M], categories, if anything still remains in the residue, then it might be personality—as a corollary of the "five and only five fundamental categories" But this method does not work all the time, especially when there are more facets than categories. M.A. Gopinath (1985) later maintained that the residual method was no longer necessary for this purpose. Personality is incarnate in persons (individuals or groups), communities, institutions, animal and plant families, body organs, chemical elements, agricultural produce, languages, religions, art styles, political systems or ideologies, laws and the like. It is indicated by a comma.

4.3.7 Facet formula: citation order

Rounds and levels of facets: It is not necessary for the subject of a document to be composed of all five catego-

ries. It may encompass any number of categories from one to five depending upon how far it is compounded or micro. On the other hand, a category may also occur more than once in the same subject. A category may manifest itself in more than one concept in micro subjects. Recurrence of a category is accounted for and accommodated by the ingenious postulate of rounds and levels. The PMEST formula is, in fact, comprised of many so-called rounds and levels of facets. For example, in class O, Literature, the category [P] personality occurs four times (Language, Form, Author, and Work), each at the same hierarchic level. In the subject, "Treatment of human diseases," both diseases and treatment are manifestations of the first and second rounds of energy, respectively, in the sixth edition. A subject aspect "Summer of 2016" manifests two levels of the time facet. Thus, in a facet formula, facets of the same category may occur more than once to be accommodated in a logical citation order. Ranganathan (1960, 1.27-1.28) postulated that:

- Space and time occur only in the last round of the facet formula;
- Categories [P], [M], and [E] can occur in various rounds;
- Levels occur only within a round;
- Within a round [P] and [M] can also occur at many levels;
- Energy always completes a round and has no level, but only rounds.

To mechanize the arrangement of categories and their recurring but scattered facets, Ranganathan after a long trial, finally settled on the general, all encompassing, and very handy facet formula famous as PMEST. Rounds of categories and, within a round, levels, are arranged by the Principle of Dependency, which Ranganathan formulated as the Wall-Picture principle: Since there cannot be any mural without a wall, so the wall is made the first facet. The master Wall-Picture principle has various corollaries formulated in such axiomatically worded principles as the Whole-Organ principle (whole-part relationship) and the Cow-Calf principle (principle of appurtenance) to arrange rounds and levels of facets; the more complex Actand-Action-Actor-Tool principle is obtained by a mix of the above principles. Actand or Actee is someone on which action is performed. For example, Actand is a patient on which Action (surgery) is performed by the Actor (doctor) with laser (tool).

In the sequence, the basic facet, invariably represented by the main class or its amplification by system (Sm), environment (Env), or specialization (Sp), precedes other facets. The grand general facet formula may be represented as follows:

> (BF), [1P1], [1P2], [1P3], [1P4]; [1M1]; [1M2]; [1M3]: [E], [2P1], [2P2]; [2M1]: [2E], [3P1]…:[3E]. [S1].[S2]'[T1]'[T2]

Numbers prefixed to a category indicate its round, while numbers suffixed to a category indicate its level, e.g., [2M1] is 2nd round 1st level Matter.

In the current edition of *CC*, the total number of facets and their general sequence is as follows (Ranganathan 1987, 49-51):

> Field of study → System → Environment → Specials →Object of study→ Kinds/Parts of object→ Properties of object→ Action on the object→ Kind of action → Method of action → Agent of action → Instrument of action →Space → Space qualifier → Time→ Time qualifier.

4.3.8 Absolute syntax: quest for a Holy Grail

In his spirited quest for discovering a natural order of facets, Ranganathan proposed the idea of an "absolute syntax of facets," by which he meant a sequence in which component facets of a subject "arrange themselves in the minds of the majority of persons" (Ranganathan 1987, 579-82). Indeed, he conjectured that absolute syntax may be the "same for a large majority of persons irrespective of their mother tongues," so that absolute syntax and linguistic syntax do not necessarily coincide. He further believed that absolute syntax was close to his own PMEST citation order, arrived at by rigorous postulates and principles. The basic question is whether there exists such an absolute syntax of ideas in the minds of the majority of adults, free from the constant influence of the mother tongue and its grammar as impressed on human minds since infancy. Yet there is no empirical evidence that it exists at all[8]. Nevertheless, as Iyer (1995, 184) asserts, "If a particular way of structuring a subject can be easily understood in translation to another language, regardless of the linguistic variations of individual tongues, then an absolute syntax may exist at some level." Arthur Maltby (1975, 199) points out that Ranganathan believed in knowledge synthesis rather than in its mere division for mapping and information retrieval; this makes the search for the absolute syntax of ideas worth pursuing by a highly varied interdisciplinary group of researchers.

4.3.9 Synthesis

Analysis is followed by synthesis of facets in an analytico-synthetic classification. For any document, first of all subject *per se* is to be separated from common isolates denoted by Roman lower case, and added after the sub-

ject facets with their own indicator symbols. These are the two types: anteriorising and posteriorising.

Anteriorising Common Isolates (ACIs) denote forms of documents, e.g.:

a bibliography	r administration report
k encyclopedia	s statistics
m periodical	t commission report x collected works

These are added with a connecting symbol (indicator) double inverted comma ["] and documents fitted with ACI file anterior to core documents. Posteriorising Common Isolates (PCIs) which denote associations, centers, critical studies, are further instances of three types: Personality, Matter-Property, and Energy.

b14	calculation
aTc	critical study
t	educational/research institutions or learned societies

These are added with their respective indicator symbols of comma, semicolon, and colon respectively, and take the document to a backward position:

2;5 'P"a	Bibliography of twenty-first century library classification
2;5"k1,P1 2;5.1,g,N9	ISKO Encyclopedia of knowledge organization (IEKO) International Society for Knowledge Organization (ISKO)
2.73,g,M7	American Library Association (ALA)
2.73,g,M7,1;3	Functions of the President of the ALA
2,J1*Z. 73:a T	Assessment of U.S. academic libraries
E*Z: aR	Research in chemical sciences
Y;aa	Theories of sociology

Class numbers look like lengthy algebraic equations, or even unwieldy and surrealistic. Savor a few:

20th century bibliography on Merchant of Venice by Shakespeare
O,111, 2J64, M+V" aN
Homeopathy for treatment of heart diseases of old people living in high altitudes
L-L-9Un4-9E, 32; 4:6
A history of the Association of Commonwealth Universities
T,18.1=CN48,g, 9N" v
The US armament policy towards Pakistan from 1975 to 2017
V, 73; 1844X=M1'P17□ N75
India's foreign policy towards Muslim countries
V, 44; 181= (Q, 7)
Sociological abstracts
Y" a" m73, N

(Mind the punctuation marks!). Ranganathan sacrificed the brevity and simplicity of notation to make the notation extremely hospitable, and to produce finely coextensive class numbers. His motto was "be minute, be minute, and be too minute." Most classifiers are afraid of the notation, and find the varying synthesis rules quite baffling. All that make the system unpopular, even dreaded.

4.3.10 Shelf Arrangement

Principle of Inversion: *CC* follows the Principle of Inversion first used by the Universal Decimal Classification (UDC). It means that the citation order of facets in the facet formula is the reverse of their arrangement on the shelves. To elaborate, though the [T] is the last facet in the PMEST citation order, the subjects fitted with only [T] will file before [S] category, which in turn will file before [E], and so on. In the PMEST facet formula, categories are arranged in order of decreasing concreteness: [P] Personality is the most concrete and [T] Time the most abstract, or least concrete; [E] Energy lies midway, being as much concrete as it is abstract. On the shelves or in a classified bibliographic database, however, the order of subjects is from general to specific, that is, from abstract to concrete, i.e., from [T] to [P]. Overall order on the shelves within a class comes out to be:

General treated generally
General treated specially
Special treated generally
Special treated specially

This order is achieved ingeniously by fixing the ordinal value of semantic and indicator symbols, e.g., the ordinal value of the indicator for [T] is less than that of [S], and so on. The other class numbers are arranged in the ascending order of a/z, 0/9 and A/Z.

4.3.11 APUPA pattern

Within a given specific class *CC* arranges documents on the shelves in a regular pattern, what is termed the APUPA pattern (Satija 2001, 208-209). The letters of this acronym stand for different pockets of documents in a given and related class: The A on both ends of the acronym represents Alien (or related) subject zones; Ps denote Penumbral regions. The first Penumbral area comprises associated documents such as bibliographies or

dictionaries which are preliminaries to the U region proper —which houses pithy core subject documents. U is the Umbral region, having core documents on the subject. The second P region accommodates advanced documents such as advances in the subject, critical studies, research organizations or centres for the advancement of the discipline. Obviously such documents are studied after comprehending the core documents in the U region. The general APUPA pattern is achieved by postulating two kinds of common isolates: Anteriorizing Common Isolates (ACIs) and Posteriorizing Common Isolates (PCIs). Common isolates are like the standard subdivisions of DDC or form and viewpoint common auxiliaries of the UDC, which are attachable to any class, irrespective of its specificity. Documents having Anteriorizing Common Isolates are not the subject proper, but form approaches to a subject. They include, for example, bibliographies, synopses, histories, and glossaries of a subject. Documents fitted with ACIs are filed anterior to the subject proper. This forms the first penumbral region, having less of the subject proper. Then follows the proper, pure, one hundred percent subject with all its subdivisions. For example, basic, compound and complex subjects constitute the umbral region in the pattern. This is followed by another penumbral region formed by fitting documents lying in the umbral region with PCIs. These are documents about the subject that are best read by advanced students or researchers after the mastery of the core subject (U). These include educational and research institutes in the subject, critical reviews, and recent advances in the subject. Thus the umbral region is surrounded on both sides by penumbral regions of differing natures, which in turn are flanked by two different alien regions on both the ends. The APUPA pattern, unique to *CC*, is one of the most logical, pedagogically useful, and beautiful arrangements of documents on the shelves. It uniformly and constantly weaves a perceptible pattern of documents on the shelves, or of their surrogates in a bibliography. The arrangement is so impeccable that it is appropriate to say that to browse a *CC* classified library is "itself an education" (Palmer 1961, 206-207). Ranganathan (1967b, 61-62) claims that it reduces noise while locating documents on the shelves, or retrieval of their surrogates in a classified database. This has been achieved by investigating deeply the varied forms of documents and arranging them within a given class in a progressively pedagogic way (see figure below).

APUPA on the shelves is a continuum from A/Z classes.

4.3.12 Index

The sixth edition had many subject indexes, but the seventh has none attached to it. CINDEX, a machine readable index to *CC*-7 on a CD in UNESCOs WINISIS, was issued in 2002. It is waiting to be incorporated into the print edition (Ranganathan 1987).

4.3.13 Book numbers

The *CC* espouses a comprehensive and sound chronological book number system for the sub-arrangement of documents by the year of publication. It was based on a chronological system devised by W. S. Biscoe (1853-1933) and endorsed by his mentor Melvil Dewey. But Ranganathan's system is much more systematic, sophisticated and comprehensive in its approach. He made it an integral part of *Colon Classification*, and also provided a Canon of Book Number (Ranganathan 1967a, 503) to make it mandatory for every classification system, and every library to make it an integral part of the call number. The broader formula for book numbers is [L][F][Y].[V]-[S];[C]:[g]—standing for language, form, year of publication, volume, supplement, copy and commentary respectively, of the book. Each of the first three facets has its own schedule of isolates, while the rest of the facets are represented by their inherent numeral in order to construct the book number for the document. It helps to keep together a book and all its associated volumes, copies, supplements and commentaries. For example, a 2017 book of quotations in the French language (irrespective of its subject) will get the book number x122Q7. In practice this elaborate looking but mechanical and mnemonic system, most of the time turns out very brief book numbers, even of just two digits. By all accounts it is the most systematic book numbering system ever devised (Satija, 2015a).

5. Revision, use, status and future

5.1 Revision and use

Despite being promoted as India's national scheme of classification by some patriotic enthusiasts (Parkhi 1965), *CC* is not a widely-used system in India. The *DDC* outranks any other system in popularity in the country. Though no register of its users has been maintained, according to a very favorable estimate some twenty-four percent of libraries were using the *CC* system in India in

A	P	U	P	A	P	U	P	A	P	U	P	A	P	U	P	A	P	U	P	A	P	U	P	A

Figure

the 1960s. No new library is adopting it as it is dated and there is no support from any institution for troubleshooting. The quick succession of six editions from 1933 to 1960 also led people to view it as an experimental system, rather than a stable one, and still in the making. Nevertheless, *Colon Classification* class numbers are given as a bibliographic element in entries in the Indian National Bibliography (Satija 1986). It badly needs revision (Raghavan 2015), but there is no national committee or substantive institutional backing to advise or to take responsibility for its revision or publication. Efforts to revive and revise it have been to no avail, because of the enormity of the task, and the lack of collective efforts and enthusiasm of its adherents (Satija 2015b). It is now repeatedly reprinted by a commercial publisher for legions of students. Its theory and practice is still taught in all the Indian library schools, partially out of deference to the legacy of Ranganathan, but mostly due to its sound theory applicable in the practice of other systems such as the *DDC* and UDC. In India, it has been the most popular system for writing and research as evidenced by the largest bibliography on it (Satija and Singh 1994)[9]. More than a dozen textbooks on *CC* in English and in some Indian languages have been published for students.

5.2 Status and Future

The system is based on postulates and principles integrated into a coherent, fully and finely developed theory of classification. Francis Miksa (1998, 67) aptly says that Ranganathan "treated library classification as a single unified structure of ideas which followed from a cohesive set of basic principles." For this, Ranganathan evolved appropriate principles and forged precise tools. The theory of *CC* is, in fact, considered as the theory of classification in general, and is taught in many library schools the world over. The contribution of *CC* lies in its facet analysis technique, the concept of fundamental categories, and a raft of practical postulates and hospitality devices. Above all, it provides scientific and concrete guidelines for the construction of any new classification system (Vickery 1960; Ranganathan 1964). Many depth and special classification systems have been designed using *CC* methods, as listed by Kaula and Prasad (1981) and the Indian Statistical Institute (2012). It can be used to design other indexing vocabularies such as thesauri, subject headings (through chain indexing), or depth classifications for micro subjects. Its facet analysis is immensely helpful in query formulation for better recall and precision of output in any retrieval system (Neelameghan1993). Some search engines and Web directories are using Ranganathan's approach with good results for retrieval on the Web (La Barre 2007; Tunkelang 2009). Glassels (1998) for one wonders whether Ranganathan anticipated the WWW and search engines. David Ellis and Ana Vasconcelos (1999) have lucidly explained the use of Ranganathan's theories for organizing and searching the web. Advances in classification theory and practice in the online environment very much depend on facet analysis (Slavic 2008). Apart from two very comprehensive bibliographies on Ranganthan, one by Das-Gupta (1967) and other by Satija and Amrik Singh (1994)[10], there are numerous bibliometric studies on Indian library literature. In all such studies Ranganthan dominates the scene with his enduring contribution. However three important studies, one before the Google era (Lancaster, Zeter and Metzler 1992) and two very recent ones studying Ranganthan's presence in databases Smiraglia (2014), Das and Mishra (2015) attest his continuing relevance and international popularity. Lancaster's team made citation analysis of Ranganthan's writing from 1956 to 1990 to report that his influence continues intact (268): "Citations to the *Prolegomena* … (95), *Colon Classification* (69) and *Five Laws* … (28) account for more than a third of the total citations (690)." They further observed, "Facet analysis and subject structuring get substantial references, including computer generation of thesaurus, deep structure indexing systems and expert systems design." Impressed by depth and breadth of his contribution they concluded that hardly anyone can match his diversity of contributions to LIS field.[10] Smiraglia (2014) employing domain analysis technique to the references of the last three decades in the database of the Web of Science™ (WoS) shows Ranganathan's legacy in the twenty-first century is leading the KO domain to a new territory. He empirically reviews and maps Ranganthan's influence on research in KO to demonstrate with evidence that facet analysis is "fuelling its popularity in KO systems and web engineering." His research shows Ranganathan's ideas from starting discussion to the current era of progress in KO. His legacy is an integral part of the twenty-first century research in this widening domain. Das and Mishra almost came out with similar results finding *Prolegomena*, *CC* and "Five Laws …" as the most popular and highly cited works in the Google Scholar (GS), WoS and Scopus® databases. Quantitatively they reported citations: *Prolegomena* 748 (GS), 127 (WoS), "Five Laws …" 671 (GS), 87 (WoS), and the *CC* 559 (GS), 177 (WoS). His other books such as *Elements* of *Library Classification* (1940s), *Philosophy of Library Classification* (1950s), and *Classification and Communication* (1950) also continue to be considerably cited all over the world. Relevant journal articles in these databases discuss the theories of facet analysis and faceted classification systems. They found out (295): "Many authors also discuss Ranganathan's theoretical framework in today's context, analysing his in-

fluence in designing modern ICT-enabled information systems and retrieval techniques." Citations also indicate his theories are contextual in semantic web applications, designing search interfaces, organising and accessing web resources and other specialised databases. This study also documented that his seminal work continues to guide us to formulate multidimensional and multimodal information architecture to design semantic web and ontologies. "Ranganathan's principles can be applied for multilingual knowledge representation, and designing efficient search and retrieval interfaces for the common netizens," they find out further (298). In view of such studies nothing could be more appropriate than the American Library Association's 1992 tribute describing Ranganathan as the "librarian to the world."

There is, on the other hand, also important criticism of the theoretical status of *CC*. Parrochia and Neuville (2013, 15-16) wrote:

> The advantages of *CC* are numerous. The first one is a greater flexibility in determining new subjects and subject numbers. But *CC* improves on the enumerative systems in several other ways. One of them is the concept of phases which allows classifiers to readily combine … However, many problems have confronted *Colon Classification*. In particular, we must understand that the secret model of Ranganathan is, in fact, crystallography. Facets, i.e. small components of larger entities or units, are similar to flat faces of a diamond which reflect the underlying symmetry of the crystal structure, so that the general structure of Ranganathan Classification, as that of faceted classification in general, is a kind of permutohedron … This means that the determinations of the *Colon Classification* are not unequivocal ones, and that the same subject may be classified in many different ways.

Parrochia and Neuville (2013, 17) also found that

> Since the 1950s, several decades of research in Information Science did not solve anymore the problem of a general theory of classifications in library science, a dense and active research field in the last century (see Dhyani 1999). For instance, between 1951 and 1961, when S. R. Ranganathan was the "Rapporteur général" of the Committee on General Theory of Classification of the International Federation for Documentation, which was formed in 1950 on his initiative, he (see, for instance, FID 1954) and some other scientists such as de Grolier (see Maniez 1991) wrote some interesting reports, while the members of the Classification Research Group (Farradane, Fairthorne, Vickery, Foskett and others), were working on their own. But the search for a new universal standard classification, such as the original type of alphanumeric and pronounceable symbolization advocated by de Grolier in those years, remained a utopia. Twenty or thirty years later, it was still out of reach (see de Grolier 1970 and 1988) and more recently, some author was even wondering whether such a classification is possible (see Mai 2002).

5.3 Conclusion

The *CC* seems to confirm the sad experience that success of KO systems is related less to their theoretical and research-based qualities than to the strength of support for maintaining systems. The survival of the system in its present state seems uncertain because of long and callous neglect. The *DDC* is considered less advanced, but is the most successful classification. The BISAC system (Martínez-Ávila 2016) is also becoming influential because of its support from the publishing industry. Although *CC* introduced a methodology of classification that has many advantages, and that remains a strong and distinct approach in KO, some of its assumptions are regarded by many today as utopian, or even undesirable. The idea of providing a universal standardized classification of knowledge seems to be in conflict with the realization that all KO systems are cultural and temporal in their making.

Having already subtly pervaded the making of new systems and getting sublimated into a theory, *CC* has achieved *nirvana* from bodily *avatar*. Transcending the cycle of life and death, it has become a subliminal tool of information retrieval and knowledge mapping.

Notes

1. Versions of the *Colon Classification* are: Ranganathan (1933, 1939a, 1950, 1952, 1957a, 1960, and 1987; the last published posthumously, but a preview of it was published as Ranganathan 1971). Ranganathan's other major books on classification are: Ranganathan 1937 (and later editions), 1944, 1945 (and later editions), 1951a, 1951b and 1965. Ranganathan was also the de facto author of the glossary of The Indian Standards Institution (1964) and he contributed substantially to Parkhi (1972). A list of S. R. Ranganathan's books from 1931-1992 is given by Satija (1992, 169-174).
2. Apart from narration of the history and development of the *CC*, Indian Statistical Institute (2012) also includes a list of published and unpublished depth clas-

sification schedules for micro subjects designed by the faculty and students of the DRTC, Bengaluru.

3. Morville and Rosenfeld (2007, 211) explained the PMEST facets in this way:

   – Personality (the something in question e.g. a person or event in a classification of history, or animal in a classification of zoology).
   – Matter (what something made of).
   – Energy (how something changes, is processed, evolves).
   – Space (where something is).
   – Time (when it happens).

4. Moss (1964) claims that Ranganathan's categories were derived from those of Aristotle.
5. H. E. Bliss suggested the term "composite classification" for such a system. La Barre (2000, 159-160; italics in original) wrote:

   > In his own review of the *Prolegomena*, Bliss compares the similarity of the notational structures of the two systems "using the example of Overtime in Agricultural Industry in India in the 1930's—X9J:9511:44:N [Colon] —compared to UAGH.qY or TGH, UA, qY (depending upon the approach Economics or Agriculture) [Bliss]. This kind of complex classification the *Prolegomena* misterms *synthetic*. Properly *synthetic* is opposed to *analytic*. The better term would be *composite*" (Bliss, 1938 p. 303).

6. By objectively here means formally and scientifically in the form of canons and principles.
7. Hjørland (2013, 554) wrote: "The Danish linguist and information scientist Henning Spang-Hanssen (1974, 39) found that Ranganathan's distinction between idea plane and verbal plane is problematic because the description of the two planes will lead to one and the same structure; for this reason there can be no motivation to speak about the two planes."
8. A referee commented: "What about the whole research production of generative grammar of Chomsky and others?"
9. Satija and Singh (1994) with its one thousand three hundred fifty references arranged chronologically from 1930 to 1993, claims to be the largest bibliography ever compiled on a single library classification scheme.
10. Lancaster, Zeter and Metzler (1992, 276) also wrote, however, about the way Ranganathan is quoted in the literature:

    > Nevertheless, it is also necessary to point out that many of the references are very superficial ones, acknowledging some intellectual debt to Ranganathan without actually explicating Ranganathan's work or even explaining in detail the nature of the debt. A few authors seem to make such non-substantive references to Ranganathan in more or less every article they write.

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