Brief Communication:

A Systematic New Lexicon of All Knowledge Fields based on the Information Coding Classification†

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Ingetraut Dahlberg started work on thesauri and classification in the early sixties. She developed her concept theory in 1972 together with her work on the establishment of a universal classification system of knowledge fields, the Information Coding Classification, published in 1982. In 1974, she founded the journal *International Classification,* now known as *Knowledge Organization*, and was its editor for 23 years. She also founded the German Society for Classification in 1977 and chaired it until 1986. In 1989, the International Society for Knowledge Organization was founded, and she served as its president until 1996. In 1980, she founded the INDEKS Verlag, which was taken over by Ergon Verlag in 1997.

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ABSTRACT: A new lexicon of all knowledge fields in the German language with the terms of the fields in English is under preparation. The article is meant to provide an idea of its genesis and its structure. It will, of course, also contain an alphabetical arrangement of entries. The structure is provided by the Information Coding Classification (ICC), which is a theory-based, faceted universal classification system of knowledge fields. Section (1) outlines (1) its early history (1970-77). Section (2) discusses its twelve principles regarding concepts, conceptual relationships, and notation; its 9 main object area classes arranged on integrative levels, and its systematic digital schedule with its systematizer, offering 9 subdividing aspects. It shows possible links with other systems, as well as the system's assets for interdisciplinarity and transdisciplinarity. Providing concrete examples, section (3) describes the contents of the nine levels, section (4) delineates some issues of subject group/domain construction, and section (5) clarifies the lexicon entries.

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1.0 Origin

The title of my 1970 dissertation was: *A Universal Classification System of Knowledge—Its Ontological, Scientific-Theoretical and Information-Theoretical Foundations* (Dahlberg 1974a). A substantial part of the study surveyed the six extant universal classification systems, partly dating back to the 19th century, and still in use. The analyses brought out their weak points and system-inherent shortcomings. This survey led to the formulation of 30 theses covering generalities, conceptual foundation, knowledge ordering in general and with respect to classificatory aspects and statements, and the working of a universal classification system. These findings served as a basis for the conception and eventual elaboration of an innovating modern universal ordering system, entitled *Information Coding Classification*, which can be considered a universal classification system for all extant knowledge fields, although further subdivisions are

still possible, viz. by theories, objects, methods, and activities, as well as further aspects and fields of application.

A knowledge field is an occupational sphere that gathers a group of people for research, operational and publishing activities, and the development of relevant concepts and terminologies, enjoying its own social status. The denomination of such fields generally consists of two parts which feature the object and activity, e.g., anthropo-logy, philo-sophy, astro-nomy, or compound terms ending in "studies," "science," or suffix "-ing" (e.g., "banking"). Ending in "-ics" is also common (e.g., mathematics, statistics, politics), although there are other words, such as polemics or relics which have no such significance (Dahlberg 1974b).

A collection of knowledge fields had been suggested in 1971 by UNESCO in its UNISIST programme with a view to producing a "Broad System of Ordering (BSO)." The then still-existing FID (Féderation Internationale de Documentation) decided during its 1972 meeting in Budapest to set up an FID-CR (Classification Research) task-force for this endeavour. A little later, the UDC committee of FID had worked out a counter-proposal. Both proposals were discussed at a joint meeting during the FID-Conference in The Hague 1974. The FID/CR part contained my own large collection of knowledge fields, which had been a project of the DGD (Deutsche Gesellschaft für Dokumentation). It was eventually, not quite fairly, decided at that meeting to entrust an umpire subcommittee with establishing an ultimate BSO from both opposing tenders. This body consisted of two UDC representatives and one FID/CR colleague from England, and it published its findings in 1978 (Coates, Lloyd, and Simandl 1978; Ubers 1981).

My collection of knowledge fields was updated after 1974, taking into account above-mentioned theoretical principles, and it was fitted with definitions under a research project steered by the Deutsche Forschungsgemeinschaft (DFG). In 1977, it was presented as a universal ordering system of knowledge fields at a seminar in Bangalore (Dahlberg 1977). It was published in 1982 as ICC in the journal *International Classification* (IC) (Dahlberg 1982) and again in the *International Classification and Indexing Bibliography (ICIB)* Vol.1 with subdivisions to the third sub-level. This version was taken up in the publications of INDEKS Verlag and in *Who's Who* (Dahlberg 1985), as well as in the further *ICIB* volumes.

2.0 Principles

The following 12 principles result from the theses developed in my 1972-73 dissertation (1) and have considerably helped in shaping the ICC.

Principle 1: ICC deals with concepts and concept classes. A concept conveys the synthesis of the necessary characteristics of a referent, designated by a name or a code. A concept is generated via the necessary predications of a referent, which may be an object, an activity, a property, a dimension, or a combination thereof, i.e., the particulars of any subject (Dahlberg 1987). Such "necessary predications" formulate the concept's characteristics, which are not to be confused with concept properties, such as a narrow / wide concept or new / current concept. There are formal concepts and factual concepts (Dahlberg 1980). Formal concepts rely on the Aristotelian categories and are used as facets whenever classes are subdivided. Factual concepts are combinations of formal and factual concepts which refer to real, abstract, or fictional things. In the latter case, fiction forms, e.g., part of the necessary characteristics of a concept.

The characteristics of a concept trace the relationships between concepts, for if two concepts share the same characteristics, it follows that there is a link between them which serves as a system-building feature. A conceptual class occurs whenever several concepts share the same characteristic.

Principle 2 : Systematizing relations are:

1) abstractive/generic relations (gender–species)
2) partitive relations (constituent relations: whole of–part of)
3) complementary relations
4) functional relations.

Relation 1) may be combined with 3); 2) may be combined with 4) (i.e., species of); and 1) may be subdivided by characteristics under 3). Partitive relations apply to all referents having parts. In our case of an ordering system of knowledge fields, the fields make up the wholes and their constituents form the parts, thus 2) will be combined with 4) to break down the constituents of a subject field, which always bears out a variety of sub-fields, and these will ultimately end up in objects, methods, activities, further aspects, applications. Their relations are therefore of a syntactic nature, i.e., functional.

Principle 3 : ICC uses the decimal system for ordering its main classes and aspects, under which these classes can be broken down. Starting from 9 object areas subdivided by 9 aspects, each of the resulting 81 subject groups is again subdivided into 9 subgroups so that 729 knowledge fields can be accommodated on the third level. Of course, these levels may be extended further as more knowledge fields call for accommodation.

Principle 4 : The nine main classes mentioned do not refer to scientific disciplines or combinations thereof, but are rather ontical object areas, which may be assembled to form three groups in the following way:

1. forms and structures	
2. energy and matter	inanimate nature
3. cosmos and earth	
4. biosphere	
5. human area	animated nature
6. societal area	
7. economy and technology	
8. science and information	human and societal production
9. culture	

Principle 5 : The subdivision of object areas and subject groups follows a system position plan called systematizer, which contains said aspects. The following aspects determine the ranking:

1. generalities, theories, principles
2. object area of a subject group, objects, constituents
3. field of activity of a subject group, methods, processes
4. special feature or formation of a subject group
5. personal linkage or featuring of a subject group
6. collective linkage or featuring of a subject group
7. external influence on a subject group, manufacture, technology
8. fields of application of a subject group to other subject groups and subject fields
9. knowledge-spreading and synthetizing tasks of a subject group (communication of its knowledge to other fields).

These nine aspects help subdivide the subject groups into its subject fields. The application of this principle to subject groups and subject fields ensures that searching for certain aspects will always rely on the same numbers; this mnemotechnic feature helps remember the figures and facilitates handling.

Principle 6 : The table-like presentation of the scheme (Table 1) also helps to explain the ordering of object areas from 1 to 9 as a straticulate model which reflects the strata of reality ("integrative levels") that condition each other, as pointed out by Nicolai Hartmann (1964) and J.K.Feibleman (1954), who even formulated "laws of the levels." Therefore, stratum 1 conditions stratum 2, etc. Similarly, the array of subject groups was ordered in such a way as to ensure a progression from abstract to concrete. This trend does not only relate to the close proximity of subject groups and strata, but it permeates the whole system, for it is obvious that subject groups under object area 1, "form and structures," may apply to all subsequent areas; idem to any other object area. Actually, the system thus displays a kind of step-wise development, starting with the 0-level of categories, the level 1 of purely formal groupings to level 2 of matter and energy and its aggregations into the cosmos and on earth on level 3, to provide the "ground" for any kind of natural life on level 4, to sustain human life on level 5 and societal life on level 6. Realizing their possibilities and values, mankind and society create material products (level 7), intellectual ones (level 8), and spiritual ones (level 9). By these three latter strata, new ontical object areas are created.

This straticulate, or rung model, does obviously not exclude human and societal capacities inventoried under the three last strata from also appearing under the aspect areas of the preceding six levels. It would therefore be quite possible to arrange things in a circular order—or even more appropriately in a spinning order, however, this would reflect but a mental plane. Therefore, the application of technology, which appears in detail in the productive area 7 under subject groups 73 and following, advances to the first six object areas, generally under position 7 of the systematizer.

Principle 7 : The digital ranking exposed under principle 5 (systematizer) also permits us to relate subject groups with subject fields viz. at the 3 subsequent positions. For instance, under 1 "generalities, theory," constituent combinations of a subject group may occur, such as respective history, psychology, sociology, philosophy. Such combinations form domain interactions which represent interdisciplinarity, as opposed to transdisciplinarity under position 8 where combinations call upon methods of one group exerted onto other subject fields, e.g., policy from the field of politics to be applied to the field of energy as energy policy, or similarly, agricultural policy, environmental policy, financial policy, cultural policy. The compound term always links up a subject with a

0 GENERAL FORM CONCEPTS	01 THEO-RIES; PRINCI-PLES	02 OBJECTS; COMPO-NENTS	03 ACTIVI-TIES PROC-ESSES	04 PROPER-TIES or 1st kind of field spe-cialty	05 PERSONS or 2nd kind of Field spe-cialty	06 INSTITU-TIONS or 3rd kind of field specialty	07 TECH-NOLOGY & PRODUC-TION	08 APPLICA-TION in other fields, DETER-MINA-TION	09 DISTRIBU-TION & SYN-THESIS
1 FORM & STRUC-TURE AREA	11 Logic	12 Mathematics	13 Statistics	14 Systemol-ogy	15 Organiza-tion Science	16 Metrology	17 Cybernetics, Control & Automation	18 Standardiza-tion	19 Testing & Monitoring
2 MATTER & ENERGY AREA	21 Mechan-ics	22 Physics of Matter	23 'General & Technical Physics	24 Electronics	25 Physical Chemistry	26 Pure Chemis-try	27 Chemical Technol. & Engineer-ing	28 Energy Sci-ence & Technol-ogy	29 Electrical Engineering
3 COSMOS & EARTH AREA	31 Astron-omy & Astro-physics	32 Astronautics & Space Research	33 Basic Geo-sciences	34 Atmos-pheric Sciences & Technology	35 Hydro-spheric & Ocean. Sci-ence & Technology	36 Geological Sciences	37 Mining	38 Materials Science & Technology	39 Geography
4 BIO SPHERE	41 Basic Biological Sciences	42 Microbiol-ogy & Culti-vation	43 Plant Bi-ology & Cultiva-tion	44 Animal Bi-ology & Breeding	45 Veterinary Sciences	46 Agriculture & Horticulture	47 Forestry & Wood Sci-ence & Technology	48 Food Sci-ences & Technology	49 Ecology & Environment
5 HUMAN AREA	51 Human Biology	52 Health & Theor. Medicine	53 Pathology & Pract. Medicine	54 Clinical Medicine & Cure	55 Psychology	56 Education	57 Occupation, Labor &Leisure	58 Sports	59 Household & Home Life
6 SOCIETAL AREA	61 Sociology	62 State & Poli-tics	63 Public Admini-stration	64 Money & Finances	65 Social As-sistance, Appraisal & Survey	66 Law & Legal Science	67 Areal Planification & Urbanism	68 Structure of Defense	69 History Sci-ence & History
7 ECONOMY & TECH-NOLOGY AREA	71 General & National Econom-ics	72 Applied Economics, Business Mgt.	73 Technical Sciences	74 Mechanical & Precision Engg-	75 Building & Civil Engi-neering	76 Science of Commodities & Tech-nol.ofGoods	77 Vehicle Sci-ence & Technology	78 Traffic & Trans-port.Techn. & Services	79 Service Economics
8 SCIENCE & INFORMA-TION AREA	81 Science of Science	82 Information Sciences	83 Computer Science	84 Informa-tion in general	85 Communi-cation	86 Mass Communica-tion	87 Printing & Publishing	88 Tele-communica-tion	89 Semiotics
9 CULTURE AREA	91 Language & Linguis-tics	92 Literature & Philology	93 Music & Musicol-ogy	94 Fine Arts	95 Theatre	96 Culture Sci-ence (narrow sense)	97 Philosophy	98 Religion (in general)	99 Christian Religion & Theology

Table 1. Information Coding Classification. Survey of Subject Groups

predicate: energy is subject and policy predicate. Regarding, however, 'education of sociology,' here 'sociology' is the subject and 'education' the predicate. Such linkages could be noted with a colon.

A different case occurs with position 9 whenever knowledge transmission of a subject group or subject area is at stake or any respective documentation, conference organisation, media, film etc. In all such cases, the combination embraces several subject groups, However, there can also be combinations within a subject group, e.g. processing of documents, cataloguing of periodicals. These combinations constitute intradisciplinary relations with object area 2 and activity area 3. Nevertheless, such combinations are irrelevant as long as no subdivisions of subject areas exist. Such linkages could be noted with a dot.

Principle 8 : The digital ranking of ICC allows beyond stratum 1 for a zero (0) stratum, which refers from 01 to 09 to designations of categories to be used as aspects. However, it appears that this stratum will not always apply to all object areas as may suggest the vertical order, for under object area 3 "cosmos and earth" figure two object groups, as after item 31 as the first object group followed by 32 as its activity aspect, the object group "earth" with its respective fundamental sciences 33; which entails respective constituent features, viz. air 34, water 35, land 36 as three features of the earth. Similarly, for the object area 4 "biosphere," it was necessary to spread microbiology, plant and animal biology over three object groups, together with their activities, inasmuch as these do not pertain to veterinary science or agriculture or forestry. All other object areas require respecting more or less the vertical order. Relevant aspect subdivisions of 0 stratum have not yet been done. Relative preliminary work figures, for instance, in Prof. Diemer's schedule (30), published quite a while ago. Universal systems, such as UDC and Colon Classification, contain similar lists which could serve this purpose. As regards "documentary data," i.e., the combination of a subject field or subject and a notation reflecting the type of document, e.g., a dissertation on microbiology, notations having already been elaborated under "documentary science" (item 82) could be called upon. The linkage marker therefore could be the equals sign (=).

Principles 9 + 10 : These principles refer to useful combinations of subject groups / subject area concepts to concepts of space and time. While such concepts have not as yet been elaborated for the ICC, very good solutions exist under UDC. Negotiations for concession might be envisaged with them.

Principle 11 : When the system was first presented in India, somebody from the audience found the simplicity of it convincing while reminiscent of Einstein. Indeed, the basic principles are simple inasmuch as they permit a quick overview and understanding of how it works with easily memorable rules and distribution of knowledge fields. This simplicity of structure and operation led to the proposal to use the system as a switch between the other six universal classification systems (18, 19) in order to find one's way along the inventory in large libraries, for example.

Principle 12 : In summary, the combining advantages of principles 7, 8, and 9 render the system fundamentally heuristic permitting, as with the strings of our brain, an infinite choice of combinations. This is in line with recent developments of scientific domains. In the 1994 contribution on "domain interaction" (Dahlberg 1994), it was pointed out that, apart from inter-disciplinary and trans-disciplinary knowledge fields, there are three other "cross disciplinary" approaches, viz. multi-disciplinarity in phenomena like water, to be considered under the aspects of physics, chemistry, agriculture, energy, forestry and transportation; pluri-disciplinarity, e.g., when security is involved in power stations, space vehicles, building sites, cars, TV, computing centres; syndisciplinarity for cooperative efforts of scientists and technicians from various special fields (e.g., mechanics, solid body physics, electronics and communication technology to construct e.g. a nano-roboter). However, in order to account for such combines under ICC-coding, the system will have to be completed with the ingredients of its knowledge fields. This may sound rather futuristic, but the challenge to hold up ICC deserves meeting.

3.0 Introducing the contents of the Information Coding Classification

Putting the knowledge fields pertaining to the levels shown in Principle 4 and the systematizer of Principle 5, we get to the matrix. Some explanation concerning the selection and arrangement will follow. The reader is invited to accompany me, box by box. First of all, I need to add that the General Form Concepts of the first line on top do not, in all cases, apply to the levels' vertical knowledge fields. This will be explained later. It should be noted that the integration feature has not only been applied to the vertical levels, but also within the horizontal lines.

Level 1: The Form and Structure Area is the area the concepts of which can be applied to all the fields of the subsequent levels. But why 11 *Logic* before 12 *Mathe-*

matics? Descartes and, later, Hegel had done so in their classification systems, but my reasoning was different; it is simply because Logic, still a sub-field of philosophy, is absolutely the most formal and theoretical field. There is no correct thinking without Logic; therefore there is also no Mathematics without Logic. *Mathematics,* with its object field of numbers, is followed by 13 *Statistics* as an activity subject group on this level. 14 *Systemology,* at position 4, is a special characteristic field of this area, which is based on structures, and, of course, there is no system without a structure, something which also applies to 15 *Organization Science* and 16 *Metrology*. The technological aspects can be found in 17 *Cybernetics, Control and Automation*, the determinative aspect in 18 *Standardization,* and the synthesizing aspect in 19 *Testing and Monitoring*.

Level 2: The Energy and Matter Area contains two triades of the facets 1-3 of the systematizer, namely regarding (1) *Physics* with 21 *Mechanics*, its theoretical section; 22 Physics of Matter and 23 *General and Technical Physics;* and (2) *Chemistry* under 25 *Physical Chemistry*, 26 *Pure Chemistry* and 27 *Chemical Technology and Engineering*. The position 24 for *Electronics* in between is a special characteristic of Energy, which finds its form of application in 28 *Energy Science and Technology* and its distribution and synthesizing subject group 29 *Electrical Engineering* applicable in possibly all fields of knowledge.

Level 3: In the Cosmos and Geo Area, the necessary study of the cosmos in 31 *Astronomy and Astrophysics* got the first position as a theoretical field whereas 32 *Astronautics and Space Research* is concerned with the exploration of the environment of our earth in our galaxy. It is followed by 33 *Basic Geosciences* with the fields concerning the structure and the dynamics of the earth, and specialty fields like Geodesy, Geophysics, Geochemistry, *et al*. The next three subject groups deal with specialties of the earth, namely its spheres, 34 its gaseous sphere: *Atmospheric Sciences and Technology*, 35 its hydrosphere (water): *Hydrospheric and Ocean Sciences and Technology* and 36 its lithosphere: *Geological Sciences.* Its technical subject group 37 deals with *Mining,* its application group using the results of 37 and other previous fields in 38 *Material Sciences and Technology* and, finally, the synthesizing group 39 *Geography*.

Level 4: The Bio-Area starts with 41 *General Biology,* where the fundamental laws and their fields with influence and applicability in all biological subject groups are contained, e.g., 412 Genetics, and its specialty groups: 414 Biometry, 415 Biophysics, 416 Biochemistry, and 417 Bionics. The following three groups comprise the object groups in the bio-area in their evolutionary levels: 42 *Microbiology*, 43 *Plant Biology and Cultivation (Botany)*, 44 *Animal Biology and Breeding (Zoology)*. In each of these groups their activity-related fields are included, however their more or less technology-supported and application-oriented groups are excluded. They follow under 46 *Agriculture* and 47 *Forestry*, whereas 45 *Veterinary Science* functions as an in-between-group concerned with sick animal on the one side and the reproduction aspect of animals on the other. 48 *Food Science and Technology* is, again, resource- and production-oriented and 49 *Ecology and Environment* contains the synthesizing aspects relating to the entire bio-area and all other areas.

Level 5: The Human Area starts out with 51 *Human Biology*, comprising the bio-sciences of a healthy person, eg., 511 Physical Anthropology, 512 Anatomy, 513 Physiology. Under 52 *Health and Theoretical Medicine*, all those fields are summarized which are necessary for the preservation of human health and the avoidance of sickness, including 522 Pharmacy and 523 Pharmacology. The fields of 53 *Pathology and Medicine* are arranged according to the fields under 51 and are concerned with the different ailments of the human body. 54 *Operative and Therapeutic Medicine* follows and summarizes all those fields necessary for the cure of a human disability or sickness. After these more or less biologically-oriented subject groups of human sciences follow those which refer to the powers of the human soul (which does not mean that the soul was excluded in the foregoing, as it is, of course, not separated from the living body), namely 55 *Psychology* (as presupposition for learning), 56 *Education* (training and learning) and 57 *Profession and Labour* (application of learning). In 58 *Sport Science and Sports,* we find again a potentiality of the human body and soul (preservation of vigor) and in 59 *Home Economics and Home Life,* a synthesis of activities related to the subsistence and recreation of human life in the protected environment of a home.

Level 6: In the Socio Area, the theoretical subject group is 61 *Sociology*, followed by 62 *State and Politics* as the group for subjects concerned with the conditions of nations and other kinds of communities (regional, state, international). 63 *Public Administration* may be considered the consequence of 61 and 62, concluding the triad with its activity ori-

entation. The subject group of 64 *Money and Finances* reveals a "specialty" of societal life, its "*nervus rerum*" and is the necessary precondition for economy (on the following level) and for any help of the needful, which are the subject of 65 *Social Aid/Social Politics*, both highly dependent on the will of a majority of persons to act for the benefit of individual persons, groups of persons, or communities. The consolidation of social life—if not its "normalization"—is made possible by the subject dealt with in 66 *Law*. A further and more recent societal activity is to be found in the subject group of 67 *Regional Planning and Urbanism,* which deals with the problem of an adequate use of land as the space for life and development of society. Another problem of society also on a national level—now extending to the international—is its defense against possible enemies (preservation of countries and nations) in 68 *Military Science and Technology*. Finally, as a synthesizing and actualizing subject group, we find 69 *History* as theory and description of the development of society in the past 6,000 years excluding though Palaeontology under 339, History of the Sciences under 812, and Prehistory under 969 Archeology.

Level 7: In the Economics and Production Area, we find, first of all, 71 *General Economics* and its relation to national and international economics as the theoretical and general group. Thereafter follows 72 *Business Economics* as the subject group concerned with the management of particular companies or similar establishments. In 73 *General Technology,* only those technical devices and processes are dealt with which are applicable in a majority of technical fields. The technical specialty group is in 74 *Mechanical Engineering*, comprising the engineering of all kinds of machines, apparatuses, instruments, and plants. Next, we find again three specification groups of production, namely 75 *Building*, 76 *Commodity Science and Technology,* and 77 *Vehicle Engineering and Production*. The latter leads us to the distribution group, 78 *Transportation,* with the subjects relating to all kinds of transportation on road and railway, on water and by air. The area is concluded by the synthesizing group of 79 *Utilities and Services,* where all the other economic consumer-orientated activities are assembled.

Level 8: The Science and Information Area begins with 81 *Science of Science* as the theoretical foundation of all of knowledge handling. In 82 *Information Sciences*, information is regarded mainly as being of scientific interest and made accessible through different kinds of establishments (archives, libraries, documentation and information centers, museums). The subject group of 83 *Informatics/Computer Science* supplies hardware and software to handle scientific information, as well as any other kind of information; the forms and activities are summarized under 84 *General Information* with fields such as 842 Office Management and Technology, 843 Text Processing, 844 Consulting, 845 Advertisement, 846 Exhibitions, etc. This group is followed by 85 *Communication Science*, dealing with information exchange on a personal level and 86 *Mass Communication* as the science and activity group—public media. In 87 *Printing and Publishing,* all those procedures and establishments are assembled which are concerned with the recording and distribution of knowledge and information on documents, whereas the group 88 *Communication Engineering/ Tele-communication* takes care of subjects concerning activities and establishments for wired or wireless messages, including also the establishment of postal services. Area 8 concludes with 89 *Semiotics*, the science of signs and symbols which synthesizes all the fields of the representation and handling of knowledge and information through the means of "signs."

Level 9: The Culture Area begins with 91 *Language and Linguistics*, the mental faculty of mankind par excellence and one might ask, would it not logically belong at the beginning of everything? But Language has also a spiritual side, as the statements to be made with it can be true or false, and they can even be deliberately false. In 92 *Literature and Philology,* language is treated according to its aesthetic qualities—here, ancient and modern languages are covered. In 93 *Music and Musicology,* language receives its most adequate mode of activation. In 94 *Fine Arts,* any aesthetic statement becomes manifest through pieces of art, and, in 95 *Performing Arts,* such manifestations are vivified by interpretation and representation through living human beings. All subject groups listed thus far in area 9 are generalized and summarized once more under 96 *Culture Sciences* in a narrower sense and related—together with other human activities—to ethnic units. The last triad of the scheme is formed by 97 *Philosophy* with its main concern of questioning everything. It is followed by 98 *Religion and Secret Teachings* as the potentiality factor of every human being in its inclination towards Good and its fight against Evil containing also all known religions of mankind, whereas in 99 *Christian Religion* receives a subject group of its own, since (1) it is pre-

sent worldwide, (2) comprises the largest amount of present literature, and (3) preaches Love, Forgiveness, and Humility, through its basis, the Ten Commandments, the Sermon on the Mountain, and by the example Jesus Christ gave himself. Thus the entire scheme reaches, by its diagonal line, from left to right from the most formal subject group of 11 Logic to the most ample subject group to the benefit of mankind under 99. If one would draw the counter diagonal from 19 to 91, the two lines would meet at 55 Psychology, which is the subject group concerning man's mental faculties and consciousness, the impulse giver and mover of all our efforts.

4.0 Looking into a subject group's contents

When fixing, i.e., setting up the notation of a subject group's contents or its subfields, it was mandatory to delineate, first of all, its respective object and field of activity (position 2 and 3 of the systematizer) next to its other items, since these items form—according to the theory of science—a scientific discipline. It was clear from the beginning that the task was not easy. Indeed, already the first subject group, taken as an example, posed a problem. Logic, the science of correct reasoning, as stated by A. Menne (1966), would be incorrectly defined as “science of thinking,” for this cerebral activity belongs to psychology; thinking pertains also to epistemology (theory of cognition), a sub-area of philosophy. In order to determine the object of 'logic,' we must ask “correct reasoning of what?” Generally speaking, it would be the statements in all its elements. This would mean that “elements” were the contents of logic. When applied to mathematics, cybernetics, law, etc., other concepts such as “values,” “magnitude,” etc., may function as “elements.” Naturally, the elements of statements are “words,” which, in turn, are the objects (elements) of linguistics. “Concepts” will not do either, because these are the units of knowledge and form the object of the theory of science. Nor will “signs” do, since these belong to semiotics. Remain hence for the object “statements” with all their various types and properties. It is worth noting that A. Diemer and Ivo Frenzel (1974) reached the same conclusion.

The field of the activity of logic consists of what will happen to statements via the so-called kinds of logic as in computations relating to form statement logics, predicate logics, class logics, relation logics a.o.. The special feature of logic—position 4—consists in the use of convenient signs as summed up under the concept of "symbolic logic." Particular forms of logic—positions 5 and 6—apply to "syllogistics" (science of conclusion), which dates back to ancient Greece, but is still taught today under logic and the "many-valued logics." A free position follows the application of logic in other subject groups such as mathematics, statistics, cybernetics, physics, law, etc., at position 8. All positions from 2 to 8 are framed into two stereotypes, namely the general and theoretical problems of a discipline, or subject field at position 1 and its teaching, organization and information at position 9, both relevant to other fields of the system.

From this analysis, it may become clear that the establishment of universal classification systems based on disciplines and their subsumptions as taught at universities is another matter and does not correspond to the "logic" of the ICC; it does not account for this traditional approach. University teachers may not share this view. But also, they need not use ICC for their practice. Indeed, the extant universal classification systems set out from university disciplines, but got into trouble when, all of a sudden, new disciplines appeared which did not fit into the system's pattern. For instance, psychology was accounted for—in the late 19th century—as a sub-field of philosophy in the Dewey Decimal Classification, as well as in the Universal Decimal Classification, where it still persists as such. On the other hand, this shows the logic of the ICC system in that there is always only one main position per concept, from where links lead to all other concepts of the system.

As regards designations, things have changed considerably over the years. Under logic figured, e.g., "logistics," introduced in 1904 by Coutturat et al. as an area of logics for logistical computations. This term now serves in the army and transportation for the organisation of their service supplies with the effect that "logic" no longer calls on this term for its computations. Similarly, the term "formal logics" as used by A. Menne (1966) for the above-mentioned computations will not fit, either. "Logic" as figured in subject area 1 represents the so-called formal sciences so that the expression "formal logics" would be tautological, inasmuch as there is no opposition in the form of a material logic of concepts and definitions, which has gone to Theory of science under Science of Science, 81.

This shows that, in respect of common usage, updating of classification systems will be mandatory, not to speak of permanent scientific innovations, which, in a system like ICC, will find their natural positions easier by the categorial basis of their systematizers.

5.0 Preface to the lexical part

Subsequently, definitions and synonyms of the designations of subject groups and their next level subdivisions are figured, i.e., to the second and third rank of entries corresponding to ICC as discussed. Under Principle 2, four types of relations are listed, viz. the abstraction/generic relation, the partition relation, the complementary relation, and the functional relation. These types also correspond to four types of definitions. Now, an ordering system is a definitory system as well, since many concepts are defined via their higher concept plus its specific features, whereby it complies with the first type of relations. Whereas if one or several sub-concepts form part of a higher concept, the second type of relations is involved (cf. Dahlberg 1987).

The subsequent definitions of ranks 2 and 3 of the nine object areas were, in most cases, taken over from dictionaries. It should be noted that these are not always definitions, strictly speaking, but rather descriptions. On the other hand, partitive definitions have been used in many cases wherever a subject group can be characterized by its sub-fields, for whose concepts actual definitions were available. This applies also to lower rank concepts which, however, it would be premature to list in this context. Most of the sub-fields mentioned will appear in the index, whereby the subfields of their subject groups may be retrieved. All of the concepts have been taken from a vast compendium of index entries, covering all sorts of resources including lecture inventories, etc. Definitions were added from encyclopedias, general lexica, and special dictionaries under projects of the 1970s. Although definitions won't change too often, they nevertheless should be rechecked by specialists. On winding up ICC, the deadline was too short to cope with this. Therefore the present collection of definitions should be regarded as a challenge for researchers to upgrade them in light of new insights. The source material for the definitions is indicated by a 3-letter code which will appear in the printed appendix with respective bibliographies. The marker "Da" indicates all cases where, on the basis of available lower rank concepts, ad hoc partitive definitions have been used. An English equivalent completes the wherever necessary remarks on each defined concept.

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Scope

The more scientific data is generated in the impetuous present times, the more ordering energy needs to be expended to control these data in a retrievable fashion. With the abundance of knowledge now available the questions of new solutions to the ordering problem and thus of improved classification systems, methods and procedures have acquired unforeseen significance. For many years now they have been the focus of interest of information scientists the world over.

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(1) clarifying the theoretical foundations (general ordering theory/science, theoretical bases of classification, data analysis and reduction)
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