Knowledge Organization: A New Science?*

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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 founded also the German Society for Classification in 1977 and chaired it until 1986. In 1989 the International Society for Knowledge Organization was founded with her as president until 1996. In 1980 she founded the INDEKS Verlag, which was taken over by Ergon Verlag in 1997. She organized many conferences, taught at universities and polytechnics, wrote a few books and more than 250 articles and is still interested in ISKOs activities as a member of its Scientific Advisory Council.

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ABSTRACT: In ISKO's name, the term "Knowledge Organization" (KO) denotes already the object and the activity area significant for the existence of any science. Both areas are outlined and their specific contents shown. Also a survey of its special subfields is given. The science-theoretical foundation of Knowledge Organization as a new scientific discipline is based on the propositional concept of science. Within a universal system of the sciences, KO has been regarded as a subfield of Science of Science. Concludingly it is proposed to find the necessary institution for work in concerted effort of scientists, knowledge organizers and terminologists on the collection, definition, and systematization of concepts of all subject fields, utilizing the Information Coding Classification (ICC) as the necessary categorizing structure.

1. About the Name "Knowledge Organization"

When founding the "International Society for Knowledge Organization e.V." (ISKO) on July 22, 1989, we chose this name, because already 60 years ago the American librarian Henry Evelyn Bliss used the composed term, "Organization of Knowledge" in his two books published 1929 and 1933, respectively, i.e. *The Organization of Knowledge and the System of the Sciences* and *The Organization of Knowledge in Libraries*. However, we also considered the term "knowledge order," a designation we had equated with "classification" when founding the German "*Gesellschaft für Klassifikation*" in 1977. This can be seen in the symbol we gave to this Society in the years 1977-1989. However, after some discussion we favoured the term "Wissensorganisation" (i.e., "Knowledge Organization"), as it allowed a direct translation into English, whereas the term "order" in combination with knowledge might be misleading, because of the verb "to order" (e.g. a service, a product).

The concept of "organization" however, in its acceptance in German has a wider range than just "order," namely "planned construction," "structure," "forming" (Wahrig 1975), although this does not apply to some other languages where "organization" is used only for collectivities like associations or unions, so that in such cases, "organization" can only be related to people, not to objects. Therefore difficulties were encountered when translating the full name of ISKO into such languages.

Our journal, entitled *International Classification* from 1974 to 1992 and from 1993 onward *Knowledge Organization* (*KO*) introduced "Knowledge Organization" as comprising "the objects and activities of concept theory, classification and indexing and knowledge representation" where by "knowledge representation" we not only understood the logical structure of conceptual representation but also all issues of naming concepts by the fittest terms, whereby questions of terminology have to be considered also.

2. About the Object Area of Knowledge Organization

According to the science-theoretical understanding, a criterion for the existence of a science lies in the fact that it possesses its own object and mostly also its own activity area. In our case, the object area is already given in the name knowledge organization. The name includes a simple concept combination, in which the object and its own activity area are already indicated, as concepts of subject and predicate, i.e. "knowledge" in the sense of "the known" and "organization" in the sense of the activity of constructing something according to a plan. These two concepts cover, therefore, the object area of knowledge organization.

However, "knowledge" in the sense of "the known" is rather vague. What is "the known" really? There are colleagues who state that "knowledge" cannot be defined. That is why I venture to introduce a more specific definition, which allows also for the actual subjective nature of knowledge:

> *Knowledge is the subjectively and objectively fairly well-founded certainty of somebody about the existence of a fact or a matter. This knowledge is not transferable, it can only be elaborated by somebody's own personal reflection.*

Although by this definition, "knowledge" is always but the knowledge of somebody, we do know – have the experience and certainty about this fact – that it can yet be shared via our ability to deal with the "things of this world," and by using our linguistic abilities to express our experience and insights. Therefore any personal, individual knowledge can indeed be transferred in space and time as it depends essentially on language and can be communicated by spoken and written words or signs. Thus this subjective knowledge needs a form of representation not only for understanding, but also for comparison in communication among people with other representations and particularly for checking against reality to verify its truth and render it intersubjective, i.e. as much as possible objective for at least a certain time. As knowledge can be represented in different degrees of complexity, analogous to the structure of matter, distinguishing as it were between atoms, molecules, compounds and entities, in our case of knowledge representation this is possible by distinguishing among:

- Knowledge elements, by which we understand the characteristics of concepts that can be gained by predicating the properties of or making statements about referents (characteristics as knowledge elements – elements of knowledge units (concepts) – should not be confused with features of concepts, e.g. broader, narrower, related, etc.);
- Knowledge units, which we equate with concepts. They are the synthesis of the concept characteristics, gained by said statements about referents and represented by a sign (word, name, term, code);
- Larger knowledge units, which are concept combinations, e.g. in statements or in definitions or just in texts; and,
- Knowledge systems, which are entities composed of knowledge units arranged in an adequately planned, cohesive structure (e.g. "system position plan," see Diemer 1968).

Therefore, the object of knowledge organization covers these four levels in relation to their referents in the real or abstract world by apprehending them conceptually and by organizing them according to a plan, viz. by grouping, arranging and verbally representing them in order to permit an insight into the relationships existing between them so that everybody can recognize them and draw useful conclusions from them. (For additional information on the concept-theoretical foundations of concept elements and concept units, see Dahlberg 1978 and 1987).

3. About the Method- and Activity-related Area of Knowledge Organization

Here one may distinguish between two applications of organizing knowledge, namely:

a) The construction of concept systems; and,
b) The correlation to, or the mapping of, units of such a concept system with objects of reality.

Regarding the construction of concept systems, the possibility of organizing knowledge contained in knowledge units, i.e. in concepts, into a systematic order, one would not need to look for outside help, as this is contained in the concepts themselves, i.e. by their concept elements, their characteristics. One could almost speak here of "self-organization" (Löckenhoff 1994) if it were not the human brain that draws the necessary conclusions from prior recognition and determination of the conceptual contents, i.e. the kind and rank of the given, essential, characteristics, the contents of a concept unit. Characteristics can be of three kinds: essential, accidental, and individualizing. Only the essential characteristics play a role in definitions and arrangement in a system, as they are also the distinguishing characteristics (differentia specifica) against the accidental, which need no special consideration. When by exploring and finding such characteristics as accomplished by statements about referents, it follows that all those concepts must be related to each other that have in common one, or more, equal or similar or functionally pertinent characteristics. Concept theory outlined by Dahlberg (1978 and 1987) distinguishes four kinds of such relationships, which can be used for the creation of concept systems in addition to other formal and functional relationships of use in knowledge organization.

Trying to define classification, the Elsinore Conference on Classification Research (Atherton 1964, 544) presented the following simple statement: "By classification is meant any method creating relations, generic or other, between individual semantic units, regardless of the degree of hierarchy contained in the system." Indeed, the determination of the closeness, similarity, or special relatedness of different items for the possibility to group and arrange them, comprises what has been considered to be the essence of forming classes. At present there are three different approaches in use to find and display term and concept relationships:

- The mathematical-statistical (numerical) approach, using cluster analysis of terms, matrix representations and corresponding similarity relationships (Bock 1974) (a purely formal method based on terms only without an indication of relationship to contents and therefore a rather vague method);
- The mathematical-conceptual approach of formal concept analysis of the Darmstadt School (Wille 1984), which uses lattice theory and visualizes the found relationships by graphs (A very elegant method, especially when displayed on the computer. Here only one of the starting publications is cited, but in the meantime this approach has gained world-wide recognition, also visible by the fact that three international conferences are held annually on Conceptual Knowledge Processing and its special knowledge is taught at several universities. Some 200 application cases have been elaborated); and,
- The concept-theoretical approach, which analyses the contents of concepts, determines concept characteristics by the method outlined above and distinguishes also different kinds of concepts and concept systems, as introduced by Wüster (1971) and partly taken up by DIN Standards, and also further developed with their corresponding kinds of definitions (Dahlberg 1978 and 1987).

Using the concept-theoretical methodology, it is possible to construct concept systems relating to given referents from either the real or the abstract realm. Most concept systems are classification systems as well, in the double sense that they represent classes of objects and concepts and determine their respective positions by notations (numbers, codes), which precisely represent their conceptual relationships. Because of their conceptual content, such notations (class numbers) can be used to classify any type of object or topic. (We distiguish between classifying and classing to show the difference in: a) placing a concept (or a class of concepts) at the correct position in a classification system (to classify); and, b) the act of using a class number when assigning it e.g. to a document (to class).) This latter possibility actually offers knowledge organization mathematical conceptual methods for use of correlating units of concept systems to objects of reality in order to understand or apprehend conceptually existing or new knowledge. Here we distinguish again two kinds of correlation:

- Classing by notations of a classification system under class numbers; and,
- Assigning descriptors, which is also called indexing, resulting in a list of single terms.

In this manner, the conceptual content of a document is indicated either by using controlled language expressions listed in a thesaurus or descriptor list – mostly with their own hierarchical and other relationship indicators – or taken from a document and

freely assigned. It is easy to realize the dangers and limitations of this latter method for a correct description of the content of a document or object, as pointed out already some time ago (Fugmann 1992). This space is too small for a discussion about how special or universal conceptual knowledge representations should appear, but there is enough pertinent literature available (e.g., Vickery 1958, Foskett 1974, Langridge 1976, Soergel 1974). It is essential to remember that the method and activity area of knowledge organization is tightly connected to its object area. Scientific statements relating to the subject field of knowledge organization therefore must be reducible to concepts of both areas.

4. About the Specific Contents of Knowledge Organization

For a quick overview of the subfields and concepts of knowledge organization, it is sufficient to browse the contents list of the bibliography on knowledge organization published in most of the earlier issues of the journal *Knowledge Organization* (until 1998). It is recalled here under Figure 1 and contains the following groupings:

- Group 0 on form, which contains only kinds of documents in the field (bibliographies, conference proceedings, etc.);
- Group 1 on general and theoretical considerations;
- Group 2 on concepts and concept classes (kinds and systems) and their elaboration;
- Group 3 on methods and activities of classing and indexing;
- Group 4 on universal systems;
- Group 5 on object related systems (taxonomies);
- Group 6 on subject related systems;
- Group 7 on concepts from other fields relating externally to the field;
- Group 8 on methods of the field as applied to document forms and subject contents; and,
- Group 9 on the so-called environment of the field, viz. its spatial and social organization, as well as issues of education, law, economic issues, use of services, standardization, etc.

These groups have been described more specifically by Dahlberg (1993b) and they are published for the field of knowledge organization with their further two levels of subdivisions. Also, a frequency analysis of usage of these groups in the current literature in knowledge organization over the past three years has been carried out, showing that there is a lot of literature under the first and last three groups, but the three middle groups are less represented (Dahlberg 1993c). The principle behind this sequencing of aspects for the subdivision of the field of knowledge organization has been called the "Systematifier" (Dahlberg 1980). It is a recurrent pattern, and can be, and actually has been, applied to every active subject field existing in Germany prior to 1979.

5. Knowledge Organization – a New Science?

It is evident from the foregoing material that the subject field of Knowledge Organization comprises a rather large conceptual framework. However, one might ask whether it is possible to speak of a new discipline on the sole ground of the extant mass of documents published thereon. Let us first see what makes a science. Alwin Diemer distinguished in his pertinent contributions (1970 and 1975), three different concepts of a science in general, viz.:

1) As a concept of culture;
2) As an anthropological concept; and,
3) As a propositional concept.

Under 1) science would settle next to established domains like art, economy, and technology, with related people, institutions, apparatusses, publications, etc. Under 2) science would strive for scientific insights, thus comprising the corresponding research activities. Under 3), science would comprise the whole of pertinent statements made in its area. In this latter sense Diemer defined "science" as (my translation, Diemer 1975, 2): "oriented towards the concept (postulate) of objective epistemological truth." As a supplement to this definition he pointed out that from the causal proximity to the postulate of truth follows – inter al. – the division of a science into the classes of empirical-positive and theoretical statements.

If we revert to the *essential point* delineated above, viz. that all statements related to the field of knowledge organization must be reducible to the concepts of the two areas 2 and 3, called object and activity area, then the criterion of "causal coherence" is fulfilled for these statements and their scientific authenticity is established. Whenever this is not the case, doubts will subsist as to the relevance of a

Classification System for Knowledge Organization Literature

Outline

0 Form Divisions 01 Bibliographies

02 Literature Reviews
03 Dictionaries, Terminologies 04 Classif. Systems & Thesauri
05 Periodicals and Serials
06 Conf. Reports, Proceedings
07 Textbooks (whole field)**
08 Other monographs**
09 Standards, guidelines

1 Theoretical Foundations & General Problems

11 Order & Knowl. Organiz.(KO)
12 Conceptology in KO
13 Mathematics in KO
14 Systems Theory and KO
15 Psychology and KO
16 Science & Knowledge Org.
17 Problems in KO
18 Classification Research (CR)
19 History of KO

2 Classif. Systems & Thesauri (CS&T). Structure & Constr.

21 General Questions of CS&T
22 Structure & Elements of CS&T
23 Construction of CS&T
24 Relationships
25 Numerical Taxonomy
26 Notation. Codes
27 Maintenance, Updating & Storage of CS&T
28 Compatibility & Concordance between Indexing Languages
29 Evaluation of CS&T

3 Classing & Indexing (C&I) (Meth.)

31 Theory of Classing & Indexing
32 Subject Analysis
33 C & I Techniques
34 Automatic C & I
35 Manual & Automatic Ordering
36 Coding
37 Reclassification
38 Index Generation and Programs
39 Evaluation of C & I

4 On Universal Classification Systems and Thesauri

41 On Universal Systems in general
42 On the Universal Decimal Classif.
43 On the Dewey Decimal Classif.
44 On the Library of Congress Classif. & the LC Subject Headings
45 On the Bliss Bibliographic Classification
46 On the Colon Classification
47 On the Library Bibliographical Classif.
48 On Other Universal CS and T
49 free

5 On Special Objects CS (Taxonomies)

51 In the Form & Structure Area 1
52 In the Energy & Matter Area 2
53 In the Cosmo & Geo Area 3
54 In the Bio Area 4
55 In the Human Area 5
56 In the Socio Area 6
57 In the Econom. & Technol. Area 7
58 In the Science & Inform. Area 8
59 In the Culture Area 9

6 On Special Subjects CS & T

61 In the Form & Structure Area 1
62 In the Energy & Matter Area 2
63 In the Cosmos & Geo Area 3
64 In the Bio Area 4
65 In the Human Area 5
66 In the Sodo Area 6
67 In the Econom. & Technol. Area 7
68 In the Science & Inform. Area 8
69 In the Culture Area 9

7 Knowledge Representation by Language and Terminology

71 General Problems of Natural Language in Relation to KO
72 Semantics
73 Automatic Language Processing
74 Grammar Problems
75 Online Retrieval Systems and Technologies
76 Lexicon/Dictionary problems
77 Problems of Terminology
78 Subject-oriented Terminology Work (TW)
79 Problems of Multilingual Systems and Translation

8 Applied Classing & Indexing (C&I)

81 General Problems; Catalogues, Guidelines, Rules, Indexes
82 Data Classing and Indexing
83 Title Classing and Indexing
84 Primary Literature C & I (except 85)
85 (Back of the) Book C & I
86 Secondary Literature C & I
87 C & I of Non-book Materials
88 C & I in Subjects Fields (manual and computerized)
89 C & I in Certain Languages

9 Knowledge Organization Environment

91 Professional & Organizational Problems in gen. & in Institutions
92 Persons & Institutions in KO
93 Organizat. of C & I on a National and International level
94 free
95 Education and Training in KO
96 Legal Questions
97 Economic Aspects in KO
98 User Studies
99 Standardization in KO work

Fig.1 Outline of the Classification System for knowledge organization literature.
Further subdivisions see Knowl.Org. 20(1993)No.4, p.211-222

statement to the subject field of knowledge organization. In a much sharper form, Rudolf Wohl-genannt (1969) formulated his criteria, also basing his arguments on the propositional concept of science. However, neither space nor time permits further elaboration on these criteria here. But they should be considered if further clarification of this matter is sought.

Another essential aspect of science at large is that it affords theories, models, and hypotheses to emerge. In this respect, I should like to point out that the whole lot of more or less intuitively conceived universal and special classification systems, from the beginning of mankind until down to the whole 19th century, were not at all based on theoretical considerations. Similarly, all efforts in the past centuries towards systematizing knowledge on the part of philosophers were not useful for our purposes by the simple fact that systems were developed always only deductively by disciplines although subjects were organized based on best personal knowledge and good will. But exactly that knowledge, which manifests itself in single concepts and statements – the inductive way – did not carry. Nor did the third approach carry, the necessary use of formal relationships, originating from different concept categories. Starting from the approach that had guided Bliss in his time, the Indian mathematician and later librarian of the University Library of Madras, S.R. Ranganathan, developed a new paradigm of classification theory for the entire period following with his faceted classification system, which allows all concept combinations possible. He explained it in his *Prolegomena* (1937).

Therefore, one may conclude that the field of "Knowledge Organization" obeys the science criteria formulated by Diemer, and that it received in the past century also the necessary theoretical foundation – especially by:

- The work of Ranganathan, regarding categorization (facet analysis) and ruled concept combinations – partly already anticipated by the invention of auxiliaries through Otlet and LaFontaine in revising and enlarging the *Dewey Decimal Classification*; and,
- The work of Wüster regarding system formation on the basis of the two hierarchical forms of concept systems using the Logic of Port Royal.

Further, researchers such as E. de Grolier (1962) and J. Perreault (1965) have extended the knowledge about relationships between concepts, especially also regarding their functional relations. By applying this knowledge to the construction and utilization of concept as well as classification systems and thesauri, the field of knowledge organization has developed from a more or less intuitive art into a new and a truly scientific discipline.

6. Knowledge Organization in the Universal Context of Knowledge Fields

If knowledge organization can be regarded as a new scientific discipline, into which environment would it come? Would it belong into the environment of the information sciences? In our *Information Coding Classification* (Dahlberg 1982) we postulated nine ontical areas by starting from the objects of reality, which in the sense of the theory of integrative levels according to J.K.Feibleman (1954) and Nicolai Hartmann (1964), presuppose and build themselves upon each other, and which can be specified each by nine aspect areas.

Looking at Figure 2, demonstrating these nine areas of being, it is obvious that area 8 is the one dealing with the intellectual products of man and society, which means "knowledge" and "information." In the presentation of the matrix it can be seen that under 1 always the general and theoretical aspects of an object area are apprehended, which, in the case of area 8, must be "Science of Science." Its subdivisions are then, i.a., Theory of science, History of science, Science research, etc. In the ontical area 1, the area of Form and Structure, one will find the System Sciences at the position 4 as a specialty of form and structure. Therefore it seemed logical for me regarding the system character of knowledge, as every knowledge unit is related to another one by its concept characteristics, to place knowledge organization at position 4 of science of science under 81, thus 814.

This should be regarded as a proposition only, along with the entire system of knowledge fields, as represented by this universal classification system, under which nearly 7000 concepts of knowledge or subject fields (and not as yet their contents) on a number of subdivisional levels were elaborated on the basis of their definitions. (The definitions were taken from encyclopedias, from Wahrig (1975), and from 500 special dictionaries. They were discussed with almost 300 university teachers. In this sense it forms, expressed in today's pertinent terminology, an "upper ontology.") The system could well be used for the purpose mentioned in the next chapter, but it

0 GENERAL FORM CONCEPTS	*01 THEORIES, PRINCIPLES*	*02 OBJECT, COMPO-NENT*	*03 ACTVITY, PROCESS*	*04 PROPERTY ATTRIBUTE*	*05 PERSONS OR CONT'D'*	*06 INSTITU-TION OR CONT'D'*	*07 TECHNOLO-GY & PRO-DUCTION*	*08 APPLICA-TION & DE-TERMINAT.*	*09 DISTRIBU-TION & SYNTHESIS*
1 FORM & STRUC-TURE AREA	11 Logic	12 Mathematics	13 Statistics	14 Systemology	15 Organization Science	16 Metrology	17 Cybernetics, Control & Automation	18. Standardiza-tion	19 Testing and Monitoring
2 ENERGY & MATTER AREA	21 Mechanics	22 Physics of Matter	23 General and Technical Physics	24 Electronics	25 Physical Chemistry	26 Pure Chemistry .	27 Chemical Technology& Engineering	28 Energy Science and Technology	29 Electrical engineering
3 COSMO & GEO-AREA	31 Astronomy & Astrophysics	32 Astronautics & Space Research	33 Basic Geosciences	34 Atmospheric Sciences & Technology	35 Hydrospheric & Oceanol. Sci. & Technology	36 Geological Sciences	37 Mining	38 Materials Science & Technology	39 Geography
4 BIO-AREA	41 Basic biological Sciences	42 Microbiology and Cultivation	43 Plant Biology and Cultivation	44 Animal Biology and Breeding	45 Veterinary Sciences	46 Agriculture & Horticulture	47 Forestry & Wood Sci. & Technology	48 Food Science and Technology	49 Ecology and and Environment
5 HUMAN AREA	51 Human Biology	52 Health and Theoretical Medicine	53 Pathology and Practical Medicine	54 Clinical Medicine & Cure	55 Psychology	56 Education	57 Profession Sci., Labor. Leisure	58 Sport Science and Sports	59 Household and Home Life
6 SOCIO AREA	61 Sociology	62 State and Politics	63 Public Admln/stra-tlon	64 Money and Finances	65 Social Aid, Social Politics	66 Law	67 Area Planning, Urbanism	68 Military Science and Technology	69 History Science and History
7 ECONOMICS & TECHNO-LOGY AREA	71 General and National Economics	72 Business Economics	73 Technology in general	74 Mechanical & Precision Engineering	75 Building	76 Commodity Science & Technology	77 Vehicle Science and Technology	78 Transportation Technology & Services·	79 Utilities and Service Economics
8 SCIENCE& INFORMA-TON AREA	81 Science of Science	82 Information Science	83 Informatics, computer slence	84 Information In general	85 Communicat. Science	86 Mass Communlca-tion	87 Printing and Publishing	88 Communication Engineering	89 Semiotics
9 CULTURE AREA	91 Language and linguistics	92 Literature and Phi1ology	93 Music and Musicology	94 Fine Arts	95 Performing Arts	96 Culture Sci-ences, nar-rower sense	97 Philosophy	98 Religion and Secret Teachings	99 Christian Religion

Fig.2: Information Coding Classification, Survey of Subject Groups ©1982, rev. 1992 I. Dahlberg. Further divisions see ICIB-1, p. 107-132.

could also serve as a switching mechanism between the existing universal classification systems in use by which the holdings of many libraries are classed. We should underline that we have worked with this system for twenty years and publicised it in the volumes of our INDEKS publishing house and improved it here and there.

7. Knowledge Organization and the Tasks of ISKO

The International Society for Knowledge Organization (ISKO) sees its tasks mainly in the area of theoretical and methodical help regarding all kinds of work relating to its field, be it for libraries, information centers, archives, museums, media, be it in systematizing sciences, administration tasks (statistics), technology, culture, terminology, etc. Its first international conference 1990 in Darmstadt "*Tools for Knowledge Organization and the Human Interface*" had a rather practical goal, whereas the second meeting 1992 in Madras, India, concerned with "*Cognitive Paradigms in Knowledge Organization*" stressed theoretical aspects. The third meeting, 1994 in Copenhagen called for "*Knowledge Organization and Quality*

Management," and was meant to stimulate self-reflection by the adherents to the field of knowledge organization on the quality management of their own activities. In the meantime further international conferences were held in Washington, Lille, Toronto, Granada, London, and Vienna. In addition many national conferences were held by ISKO chapters in Germany, Slovakia, Bulgaria, Italy, India, Russia, Spain, and France. Two subject- and method-oriented conferences were held in Slovakia (Environment) and in Poland (Compatibility and Integration).

ISKO has also committed itself to elaborating a Memorandum meant to bring the gained insights and the acquired knowledge in the field of knowledge organization to the universities in the form of a number of possibly compulsory courses during the initial semesters (Meder 1992). Above all, it seems desirable and timely for associations, such as the German Max-Planck-Gesellschaft or the Fraunhofer Gesellschaft, to consider further development of their fields of interest in the humanities, by planning and establishing an Institute for Knowledge Organization, in order that the necessary conceptual work in all fields of knowledge could be started in a concerted manner of research and production of useful results in constant exchange of the knowledge of experts in knowledge organization and terminology with the knowledge of subject experts of scientific and other knowledge fields at universities and research institutions. Would it not be in the interest of all scientists and researchers that their "products," i.e. the new knowledge they found and probably named, could be included and retrieved in an ordered system to which they themselves could contribute and which they understand and consequently would also support?

It seems of primary importance today, to relate new knowledge to existing knowledge by corresponding conceptual work, as we need to recreate the necessary order for our knowledge. And this work deserves, in my eyes, much more attention in order to keep track of scientific development and make it transparent by analyzing existing and new concepts, defining and possibly assigning them to their pertinent position in a systematic order and to render them retrievable from there for any application. In this respect, I would like to quote D. Soergel (1969): "Ich halte dafür, daß der Systematisierung von Wissen der gleiche wissenschaftliche Rang gebührt, wie der originären Forschung. (I am deeply convinced that systematizing knowledge should occupy the same scientific rank as any original research work)."

The physicist Alwin Weinberg, in his famous 1960 report to the U:S: Government held a similar opinion when he underlined the necessity of having theoreticians of a discipline in charge of maintaining their domain in good order by their insight and supervisory position, and he stressed that the Greek word theorein means "seeing," "recognizing." This is also why an Institute for Knowledge Organization can only produce significant results if collaboration can be arranged between scientists, knowlege organizers, and terminologists.

May all those in charge in the area of science politics feel responsible for ensuring the recognition of knowledge organization as a new scientific discipline, which not only offers a lot of knowledge for establishing and enhancing order in our conceptual world of today, but can also propose necessary programmes for the training of manpower, if the much-needed support can be made available. These resources would essentially contribute to the development of knowledge organization towards a new, indispensable scientific activity of great significance and usefulness in and for many application areas.

References

Atherton, P. ed. 1964 *Classification research*. Proceedings of the 2nd International Study Conf. FID/CR. Elsinore, 14-18 Sept. 1964.

Bliss, H.E. 1929. *The organization of knowledge and the system of the sciences*. New York. Holt.

Bliss, H.E. 1939. *The organization of knowledge in libraries*. 2nd ed. New York: H.W.Wilson.

Bock, H.H. 1974. *Automatische Klassifikation*: *Theoretische und praktische Methoden zur Gruppierung und Strukturierung von Daten (Cluster Analyse).* Göttingen: Vandenhoeck & Ruprecht.

Dahlberg, I. 1974. *Grundlagen universaler Wissensordnung: Probleme und Möglichkeiten eines universalen Klassifikationssystems des Wissens*. München: Saur Verlag.

Dahlberg, I. 1978. A referent-oriented, analytical concept theory for Interconcept. *International classification* 5: 142-151.

Dahlberg, I. 1980. Wissensmuster und Musterwissen im Erfassen klassifikatorischer Ganzheiten. In Dahlberg, W. ed. *Wissensstrukturen und Ordnungsmuster*, *Proc.4.Fachtagung, Ges. für Klassifikation, Salzburg, 16-19 April 1980*, pp.294-315.

Dahlberg, I. 1982. ICC–Information Coding Classification: Principles, Structure and Application Possibilities. *International classification* 9: 87-93. Also

in: *Classification Systems and Thesauri 1950-1982*. ICIB-1. Frankfurt: INDEKS Verlag, pp.107-132.

Dahlberg, I. 1987. Die gegenstandsbezogene, analytische Begriffstheorie und ihre Definitionsarten. In Ganter, B., Wille, R., and Wolff, K.E. eds. *Beiträge zur Begriffsanalyse*. Mannheim: BI Wissenschaftsverlag, pp.9-22

Dahlberg, I. 1993. Editorial: Why "knowledge organization?" The reasons for IC's change of name. *Knowledge organization* 20: 1.

Dahlberg, I. 1993b. Knowledge organization: Its scope and possibilities. *Knowledge organization* 20: 211-222.

Dahlberg, I. 1993c. Current trends in knowledge organization. Paper presented at First Conf. on Knowl. Org. and Documentary Systems, Madrid, Nov.4-5.

De Grolier, E. 1962. A study of general categories applicable to classification and coding in documentation. (Transl. from French). Paris: UNESCO.

Deutsches Institut für Normung. 1974. *Begriffe und Benennungen: allgemeine Grundsaïze = Concepts and terms ; general principles = Notions et termes ; principes généraux*. DIN 2330. Berlin: Beuth.

Deutsches Institut für Normung.1975. *Begriffssteme und ihre Darstellung*. DIN 2331. Berlin: Beuth.

Diemer, A. ed. 1968. *System und Klasifikation in Wissenschaft und Dokumentation.* Meisenheim/Glan: Verl. A.Hain, pp. 150-156.

Diemer, A. 1970. Der Wissenschaftsbegriff im historischen und systematischen Zusammenhang. In Diemer, A. ed. *Der Wissenschaftsbegriff: Historische u. systematische Untersuchungen*. Meisenheim/ Glan. Verl. A.Hain, pp.3-20.

Diemer, A. 1975. Der Wissenschaftsbegriff in den Natur- und Geisteswissenschaften. In *Symp. d. Leibniz Ges., Hannover 23-24 Nov.1973*. Studia Leibnitiana, Sonderheft 5, pp.1-13.

Foskett, D.J. 1974. *Classification and indexing in the social sciences*. 2nd ed. London: Butterworth.

Fugmann, R. 1992. *Theoretische Grundlagen der Indexierungspraxis*. Frankfurt: INDEKS Verlag.

Langridge, D.W. 1976. *Classification and indexing in the humanities.* London: Butterworths.

Löckenhoff, H. 1994. Systems modeling for classification: The quest for self-organization. In *Knowledge organization* 21: 11-21.

Meder, N. 1992. Aus- und Weiterbildungsfragen im Kontext von Wissensorganisation. In Gödert, W., Jaenecke, P., Schmitz-Esser, W. eds. *Kognitive Ansätze zum Ordnen und Darstellen von Wissen*. Frankfurt: INDEKS Verlag, p.244-51.

Perreault, J.M. 1965. Categories and relators: a new schema. In *Rev. Int. Doc.* 32, No.4, p. 136-144. Reprinted in *Knowledge organization* 21(1994): 189-98.

Ranganathan, S.R. 1937 (1967). *Prolegomena to library classification.* 3rd ed. assisted by M.A. Gopinath. Bombay: Asia Pub. House.

Soergel, D. 1969. *Klassifikationssysteme und Thesauri: Eine Anleitung zur Herstellung von Klassifikationssystemen und Thesauri im Bereich der Dokumentation*. Frankfurt: Deutsche Ges. f. Dokumentation.

Soergel, D. 1974. *Indexing languages and thesauri: Construction and maintenance*. Los Angeles, CA: Melville Publ.

Vickery, B.C. 1975. *Classification and indexing in science*. 3rd ed. London: Butterworths.

Wahrig, G. 1975. *Deutsches Wörterbuch*. Gütersloh: Bertelsmann Lexikon Verlag.

Wille, R. 1984. Liniendiagramme hierarchischer Begriffssysteme. In *Studien zur Klassifikation* 15: 32-51.

Wohlgenannt, R. 1969. Über eine Untersuchung des Begriffs der Wissenschaft. In *Was ist Wissenschaft?* Braunschweig: F. Vieweg, pp. 197-199, 238-256.

Wüster, E. 1971. Begriffs- und Themaklassifikationen: Unterschiede in ihrem Wesen und in ihrer Anwendung. In *Nachr.Dok*. 22, Nr. 3: 98-104.