privaten Haushalte in der Bundesrepublik Deutschland. (541 departments are classified into 10–15 clusters according to 31 demographic or sociological attributes (variance criterion, exchange algorithm); by cluster-specific regression methods one obtains a prognosis for the demand for water in 2000.) –

W. D. Rase/E.-M. Paech: Klassifizierung der Kreise der Bundesrepublik Deutschland nach ihrer Versorgung mit Basis-Freizeiteinrichtungen. (Departments are classified on the basis of their equipment in sportsgrounds.) –

B. Hamacher/K. Preiser: Eine Infrastrukturtypologie am Beispiel des Landes Bremen. (By using the procedures of Ward and Wishart the 78 sections of a town are grouped into five easily interpretable classes according to sociological indicators.) –

H. T. Forst: Anwendung der Cluster-Analyse zur Typisierung des Freizeitverhaltens von Jugendlichen. (On the basis of 21 qualitative leisure time attributes 154 juveniles are classified by a hierarchical algorithm.) –

W. Schneider: Taxonomie der Gedächtnisleistungen schwacher und normaler Rechtschreiber. (The hypothesis of distinguishability between legasthenic and normal pupils by their memory abilities is examined by constructing and interpreting 6 groups of pupils.) –

H.-H. Bock

SCHEELE, Martin: **Ordnung und Wortschatz des Wissens.** Entwurf zu einem Überblick über das menschliche Wissen auf der Grundlage der Wörter. 1. Bd.: Das Ordnungssystem. Universelle Facetten-Classifikation (UFC). (The organization and vocabulary of knowledge. A blueprint for an overview of human knowledge on the basis of the vocabulary of language. Vol.1: The ordering system. Universal Faceted Classification UFC). Schlitz/Hessen: Verlag H. Guntrum II, 1977. 208 p., ISBN 3-921739-01-2.

According to the author this is a universal faceted classification for two purposes, namely,
(1) to serve as an orientation or guide into the entire domain of human knowledge, a classified guide into alphabetically arranged encyclopedias, and
(2) to serve as an index language for bibliographic files, especially for personal bibliographic files.
The entire work is projected to consist of three parts, namely,

Part A – what this reviewer calls a "core classification".

Part B – a thesaurus of words of the German language expressed as combinations of semantic factors taken from the core classification and arranged by these factors, resulting in a classified sequence of the words.

Part C – an alphabetical index to part B.

The book under review contains the introduction to the entire work, the core classification (Part A), an alphabetical index of all terms used in the core classification, and some samples of entries of Part C. Thus, the subject of this review is a critical analysis of the core classification.

One might perhaps admire the courage of an author who single-handedly attempts to create a new universal classification. However, the attempt failed. Scheele produced an addition to the long list of classifications that can serve as examples of how *not* to develop a classification.

As will be demonstrated in the following analysis the main reasons for this failure are three:
(1) The author lacks insight into the principles of conceptual organization. This manifests itself in two ways:
  (1a) The scheme adheres to a rigidly monohierarchical structure without any cross references. This is all the worse in view of the fact that many concepts are not elemental but compound and thus are bound to have more than one broader concept.
  (1b) There are quite a few instances where compound concepts are included in the scheme but one or more of their more general elemental components are missing.
(2) The conceptual organization is strictly subordinate to a rigid four-digit decimal notation.
(3) In many areas the author simply does not have the expertise to produce a meaningful structure.

One must expect from a classification that it provides adequate coverage of the concepts needed for the purpose at hand, that it contains all useful hierarchical and associative relationships, and that it displays these relationships in a useful way. We shall take these points up in reverse order.

First we shall discuss the linear arrangement and relationships displayed by it.

The classification uses ten main classes:
0 General concepts
1 Matter
2 Live (living organisms)
3 Man
4 Society
5 Technology
6 Fine arts
7 The earth
8 The universe
9 Metaphysics (primarily religion)

(Like others before him, Scheele draws the absurd conclusion that since we are using the decimal system of numbers, therefore, the optimal division of human knowledge is into 10 main classes.) Scheele stresses that this subdivision by phenomena rather than by traditional scientific and scholarly disciplines is more in keeping with modern developments. However, the choice of the primary characteristic of subdivision must be predicated upon the intended use of a classification, and should perhaps be left to the user. Therefore, we shall not argue this matter further. However, we shall examine the helpfulness of the arrangement with respect to the few information science concepts included in the scheme by simply listing them with a little of their context:

019 Other general concepts
  0190 Information
  0191 Sensitivity
  . . . .
  0197 Tendency
  0198 Inventory
339 Other service professions
  3395 Librarian
  3396 Archivist
  3397 Documentalist (Dokumentar)

491 Administration of literature
(4911–4913 by type of institution as in 339;
4913–4918 by library functions)
6 Fine arts
61 Literature
618 Secondary literature
6188 Retrieval
(among concepts for types of secondary literature and others for related processes)
619 Other literature
6193 Thesauri
65 Architecture
652 Buildings for cultural purposes
6523 Library buildings

Information science is not included among 31 *Scientific and scholarly disciplines.* (3193 *Informatik* is computer science!).

There are many places where proper hierarchical relationships are not expressed because of the arbitrary limitations to four levels.

Examples:

103 Elements
1030 Elements in general
1031 Metals
1032 Heavy metals
1033 Light metals
1034 Precious metals
1035 Semi-metals

Clearly, 1032 through 1034 are narrower than 1031 Metals. Or consider this sequence:

310 Scientific and scholarly disciplines in general
3103 Natural sciences
3104 Physics
3105 Atomic physics
....
311 Chemistry
....
312 Biology
....
313 Humanities
....
314 Social sciences

The lack of proper hierarchical relationships in this sequence is caused partially by the notation and partially by the unhappy attempt to mirror the outline of the scheme as a whole in the outline of the sciences. The same mixture of reasons is responsible for the fact that under 3104 *Physics* we look in vain for *Mechanics, Acoustics, Optics, Electromagnetism* and *Solid State physics* and that 318 *Astronomy* appears as a major subdivision which, presumably since there is plenty of notational space, has listed under it *Moon science, Science of the planets, Science of comets, Science of meteors, Science of the sun,* and *Science of the stars.* The author might argue that the missing subdivisions of *Physics* can easily be produced by combination. The fact is that this would be quite difficult, at least for some of the subdivisions of *Physics*, whereas the combinations to be used for the explicitly listed subdivisions of *Astronomy* are quite obvious. Furthermore, listing these subdivisions of *Astronomy* contravenes the author's own rule given on p. 65.

Often two or three characteristics of subdivisions are used within the same array, much to the confusion of the user. (This is another consequence of the supremacy of a rigid notation over conceptually sensible arrangement).

Examples:

106 Important materials
1060 Reacting materials
1061 Water
1062 Dampness
1063 Dryness
1064 Air
1065 Catalysts
1066 Solvents
1067 Oxidating agents
1068 Reducing agents
1069 Others
576 Highway building
5760 Highway building in general
5761 Road underbed
6762 Road surface
5763 Super highways
5764 Regular highways
5765 Bikeways
5766 Riding paths
5767 Foot paths
5768 Auxiliary installations for roads
5769 Others

These examples show that the linear arrangement falls far short of indicating those relationships that could be shown by this type of display. The sad news is that these are the only relationships included in the scheme. No cross-reference between 3182 *Research on planets* and 8301 *Planets*, or among the information science concepts listed above. No cross-reference from 576 *Highway building* to 656 *Buildings for transportation and traffic which, among other things, contains* Parking lots and *Service stations.* Likewise, there is no cross-reference from 577 *Building of railroad tracks* to 6564 *Passenger railroad stations* and 6565 *Cargo railroad stations.* (There is also no broad concept *Rail transport.*)

In many cases, further explanatory notes would be indispensable for a use of the scheme. For example, under 625 *Music for strings* we find 6252 *Violin.* It is unclear whether this descriptor should be used for documents about the violin or only for documents that contain or write about music for violin. If the latter, why isn't the heading *Music for violin*, if the former why isn't the heading *String instruments* rather than *Music for string instruments*, or if both, why isn't the heading *String instruments and music for them*? Likewise, in 610 *Literature in general* does 6103 *Periodicals* stand for literature about periodicals or can it also be used to indicate periodicals as a form?

As was pointed out above, many elemental concepts are missing; the *Rail transport* example is a case in point. There is 4911 *Library Administration* and 6523 *Library buildings* but one looks in vain for *Library.* The list could go on. This is particularly odd in a classification that is called a *faceted* classification.

The subject coverage is very uneven. Such important general concepts as *Structure* or such vital political science concepts as *Power, Authority*, or *Legitimacy* are missing while 548 *Techniques of hunting* gives 6 types of hunting and 3 sub-activities of hunting, and main class 9 *Metaphysics* lists, among other things, the names of 100

(mostly Roman Catholic) orders. This uneven coverage seems to be the combined result of lack of expertise and supremacy of notation (plenty of space in main class 9), not to mention the question what these names of organizations do in a classification of concepts anyway.

For many, many areas the author would have done well to consult experts. Two particularly clear examples are 02 *Number* which purports to be a classification of mathematics and 43 *Politics*. About the latter, the author has the following to say,

> "Politics: in the beginning of the classification are the theoretical and formal concepts. These are followed by political parties. From the political parties arises the parliament. It in turn has an important influence on the formation of the government. The government negotiates treaties and has problems with minorities."

Under 600 *Levels of integration in fine arts* we find a sequence from *Letter* through *Sentence* and *Chapter* to *Entire work*, a sequence which is clearly applicable only to literature and not to the other subdivisions of fine arts.

In the explanation to main class 3 *Man* which is basically a classification of occupations one would expect some note on the relation of this scheme to at least one classification of occupations used in gevernment statistics. No such reference appears, making one wonder whether the author knows about such classifications.

To give just one more example:

666 Movie and TV art
  6668 News and comments (under Fine arts!)
667 Radio art
  ....
  6675 Radio news
  6676 Radio sport casts
  6677 Road report
  6678 Weather forecast

The latter three do presumably not appear on TV.

The scheme often shows a bias toward the situation in the Western world and more particularly in the Federal Republic of Germany, the extreme example being 3332 Bundesgrenzschiitzer (member of the border guard of the Federal Republic). Main class 9 shows an extreme bias to the Roman Catholic Church. The only place *Wedding* appears in the scheme is in 99 Sacraments, which is organized ahnost exclusively from a Roman Catholic point of view.

Lest the reader believe that a malevolent critique carefully scrutinized the scheme for bad examples (which are present even in the best classification) to downgrade a worthwhile effort: Examples illustrating the general points made in this review jump even at the casual reader, and the list could go on for almost as long as the classification itself. On the other hand, it should also be said that in places unorthodox principles for structuring are used, giving a new and useful perspective of a topic. The work might thus be useful for thesaurus makers as a source for some relationships between concepts that may not be found elsewhere.

As should be clear from this analysis, this work is ill-suited either as a guide to the structure of human knowledge or as a directly applicable index language for a personal bibliographic file. The latter purpose is ill advised anyway since the main point of a personal file is an organization from the point of view of the keeper of the file not from the point of view of somebody making a universal classification. (We shall not comment on Scheele's instructions on how to establish a personal file there is much to argue here, too.)

For the record, two footnotes are in order: With regard to purpose 1, Scheele sees his work as a complement to alphabetically arranged encyclopedias, claiming uniqueness for this purpose. Apparently, he is unaware of the classification printed as volume 1 of the new Encyclopedia Britannica. The author also makes the mistaken claim that he has developed the procedure of classifying words through defining them by a combination of semantic factors. This has been done much earlier and it has been done in exactly the same way as the author proposes in the Semantic Code developed at Western Research University in the fifties.

Dagobert Soergel

Reply to Mr. Soergel's review

When a critic, reviewing a major piece of work by a colleague, simply dismisses the book concerned as a failure attributable to lack of "insight into the principles of conceptual organization" of classification systems, then the least one should assume is that this reviewer has devoted a great deal of thought to understand his colleague's intentions and ways of thinking before formulating his judgment. But I must fear that Mr. Soergel has not done so.

1. Far from being a stranger to the principles of conceptual organization of classification systems, the author presumably has been familiar with them for a far longer time than Mr. Soergel. But the author (and with him the entire professional world) also realizes full well

- that an ideal universal classification is an impossibility,
- that various desirable properties of classification systems are mutually exclusive,
- that different, yet equally valid systems can therefore be developed for different purposes, and
- that in so doing one must have the courage to consistently adhere to certain proven principles deemed essential for the intended purpose while consciously neglecting other ones.

2. In his book the author has made it perfectly clear that – and repeatedly spelled out the reasons why – he decided to construct his system on the basis of a strictly decimal arrangement using uniformly long, four-digit numerical notations. This decision was based on many years of practical experience with some 275 000 machine-classified titles within the framework of a biology documentation system, as well as on detailed experiments with peekhole cards.– Now this decision and its consistent implementation at the expense of other principles may of course be criticized from the point of view of classification theory. But one cannot take the position that such an approach is impermissible for reasons of principle. In the end it is ,not theory but practice which decides on the usefulness of a classification system, and in actual practice the author's principles have proven their worth beyond a doubt. The efficiency of his biological retrieval procedure can be verified at any time by objective standards.

3. Charging an author with lack of expertise in many areas is somewhat lacking in originality. This charge is raised time and time again against scholars venturing beyond the limits of their specialty in search of a comprehensive outlook. In the preface to his book the author has justified his approach in detail on page 7 (bottom) and page 8, as the reader may kindly verify.

4. The division into 10 main classes arises naturally from the consistent decimal arrangement. Far from being absurd, it is in far-reaching agreement with the arrangement used in as noted a work as the Encyclopaedia Britannica and in other well-known books. It has moreover proven its worth for many years in university courses, and experience has shown that it is quite rapidly understood and found illuminating by unprejudiced users, the very audience the author had in mind.– The same applies to the more detailed arrangement down to the three-digit "basic classes" (which were called that on purpose!). It is only on the level of the four-digit special classes that the difficulties inherent in the nature of the subject make themselves felt, which difficulties were accepted into the bargain as the prize to be paid for a consistent decimal arrangement. Relevant details are abundantly available in the author's book.

5. Mr. Soergel's further criticism is almost wholly confined to the division into special classes, repeating at this point his charge of lack of expertise (see above!). It is no great feat to take arbitrary special classes out of context to use them as demonstration objects indicating alleged flaws. Experience has shown that this "proven" method can be used to reduce any classification system to absurdity. – Mr. Soergel criticizes e.g. the scattering of the concepts of the information sciences over various conceptual areas. This is wholly unavoidable once one has decided to subdivide not by disciplines but by the original data, a procedure clearly identified by the author as being his supreme guiding principle. Other fields, too, such as medicine, genetics, environmental research and many other ones continuously constituting themselves anew likewise draw their concepts from a wide variety of fields of greatly diverging logical structures. The author presumes that no one has any serious quarrel with the fact that a "thesaurus" (e.g. the one by Wehrle-Eggers) belongs to the field of "literature" and a "library building" to that of "cultural buildings", with the latter in turn belonging to the field of "architecture". In the author's opinion, the information sciences, taken as disciplines, must be counted among the "communication sciences" (3141).– There appears to be no good reason for disqualifying as an "unhappy attempt" the author's consistent observance of the same sequence in both the main classes and the corresponding basic classes of the arrangement of disciplines. The subdivision of physics into mechanics, acoustics, optics, etc. is not difficult at all but rather quite simple and at the same time illuminating: mechanics = 0930 3104, acoustics = 0970 3104, and optics = 0870 3104. – The combination of "Important materials" (106) into a special class suggests itself naturally. The author would be grateful for any suggestions of a better nature.– It goes without saying that cross-references are necessary. Within the framework of the classification system they were avoided as a matter of principle so as not to detract from the system's easy overseeability. For Part B, however, a suitable cross-reference system is envisaged.– Mr. Soergel's criticism of the class nomenclature within the superordinated class "Music" (62) is justified; a correction here presents no problems.– Mr. Soergel notes a lack of a concept "Rail transport", regarded by him as a basic concept. The question as to what are basic concepts has provided food for thought and stimulated discussions since times immemorial. The author regards any dispute on the matter as moot. In this matter he has adopted an entirely pragmatic and empirical approach. In the given case the basic class concerned looks as follows:

495 Traffic administration
4950 Traffic administration, general
4951 Road traffic
3952 Rail traffic
4953 Marine traffic
4954 Air traffic
4955 Space traffic
4956 Safety and security measures
4957 Timetables
4958 Transport
4959 Others

The word material available suggested using the concept "Transport" as basic concept, since it can be combined at will with the various traffic concepts.– The allegedly lacking concepts "Structure" (0398) and "Power" (4073) are in fact contained in the system, while other concepts may be readily incorporated into it as a supplementary measure. – The author's remarks on politics as quoted by Mr. Soergel are nothing but a brief description of the sequence of the basic classes. Taken out of context such a brief presentation of course strikes one as ridiculous. – That motion pictures and TV belong to the realm of fine arts surely needs no prolonged argumentation! But once this is accepted, news and comments (6668) cannot be excluded from this realm.

6. If Mr. Soergel, in summing up, regards the author's classification system as unusable, it must be pointed out in reply that the usefulness of the principles employed has long been proven in practice. Equally one-sided and intolerant is Mr. Soergel's remark that such a universal classification is unsuited for private users. On pages 10–15 of his book the author has given detailed reasons for his contrary opinion and precise instructions for use. Regrettably Mr. Soergel does not go into this part of the author's work at all.

7. Finally, Mr. Soergel reproaches the author for allegedly advancing unjustified claims to priority rights. However, the alleged evidence on which Mr. Soergel bases this charge is incorrect: the author is in fact well familiar with the new "Encyclopaedia Britannica" and its encyclopaedic summaries. On p. 9 (top) of his book he has made explicit reference to such summaries in encyclopaedias. This does not detract in any way from the fact that to the author's knowledge – and evidently to Mr. Soergel's knowledge, too, for if he had any pertinent knowledge he would have mentioned it – no overall thesaurus has been produced so far in any language to supplement existing works of a primarily lexical-alphabetic nature. – Active since 1948 in the field of punched-card techniques and documentation, the author published in 1954 his first book entitled "Die Lochkartenverfahren in Forschung und Dokumentation mit besonderer Berücksichtigung der Biologie" (Punched-Card

Techniques in Research and Documentation, with Particular Reference to Biology). In 1955 he published a report entitled "Die Bedeutung der Verschlüsselung für die Anwendung der Lochkarten" (The Importance of Encoding Procedures for the Application of Punched Cards). In September 1955 he presented a paper in Brussels to the FID on this subject. As early as then the author was working with the technique of classification through definition. As long as Mr. Soergel fails to produce concrete bibliographical references showing when and where this principle was applied first, his sweeping statements and judgments are valueless.

8. In summing up, the author is forced to remark that Mr. Soergel's entire review is based on thin air. If an author announces his intention of building a table, no critic can blame him for not having built a cupboard. Much less is the critic entitled to declaring the building of tables impermissible in the first place. That, precisely, is the situation here: the author has declared repeatedly and explicitly according to what principles he devised his classification and what purposes it is to serve. The reviewer, however, centers his entire citicism around his contention that the consistent application of the principles used by the author is impermissible.– Such an approach is hardly conducive to the further development and discussion of classification systems. – Such being the facts, the author can only request the readers of this reply to purchase the inexpensive (DM 26.00) book themselves to form an independent judgment.

Martin Scheele

Reviewer's response

The examples given in the review were intended to illustrate the general point of inadequate structure, not just to show a few inadequacies here and there. An examination of some of Scheele's answers serves the same purpose. According to Scheele, *Mechanics* is represented by the combination of 0930 *Motion in general* with 3104 *Physics.* Yet there are many other phenomena that fall in the purview of *Mechanics*: 081 *Forces*, 082 *Gravity*, 091 *Effect of forces*, 092 *Weight*, 094 *Types of motion.*

Acoustics is fine as shown, *Optics* should be 0860 3104 rather than 0870 3104 as a quick look at the concepts listed under 086 and 087 will show. Scheele chooses not to give a combination for *Solid state physics.* 4952 *Rail transport* listed under 495 *Administration of transportation* clearly means *Administration of rail transport*, not the elemental concept *Rail transport.* For the record, 0398 is *Structure in space*, not the general concept *Structure*, and 4073 *Gewalt* (physical force) is not at all the same as the political science concept *Power.* Finally, if one assumes that a user requesting documents on the *Performing arts* wants to retrieve documents on *TV news and comments* or *Weather forecast*, then Scheele's hierarchy is correct. If one is of a different opinion, then one must conclude that it is very well open for discussion whether *TV* and *Film* are properly subordinate to *Performing arts.* It might just be that these concepts are not in a hierarchical relationship at all, and that one should form a combination "Performing arts on TV" if that is the subject at hand.

Anybody interested in the history of the idea of concept combination (combining elemental concepts to define compound concepts), which spans at least 700 years, is referred to

De Grolier, Eric: A study of general categories applicable to classification and coding in documentation. Paris: Unesco 1962. p. 107–122, and

Dahlberg, Ingetraut: Grundlagen universaler Wissensordnung. München: Verlag Dokumentation 1974. p. 54–60 and elsewhere.

D. Soergel

MEYER-UHLENRIED, Karl-Heinrich: **Methodische Grundlagen für die Planung von Informationssystemen.** München: Verlag Dokumentation, 1977 = DGD Schriftenreihe 7, 520 p., ISBN 3-7940-3627-1.

It is not customary to review only one chapter of a book, and it may even be unfair to the author to single out a few dozen pages from a much larger work, but readers of this journal will mostly be interested in chapter 3.4. "Prinzipien der Ordnung", in which the author seeks to analyze the theoretical underpinnings of the various systems of order on which all information storage and retrieval systems are based. The concept denoted by the German word "Ordnung" is not easily translatable into English, because "order" is a polyseme; perhaps "orderly arrangement" is the nearest equivalent to the concept dealt with by the author, but for the sake of brevity, the word "order" (in this sense) will be used here.

The chapter begins with a brief discussion of "Problems of order", resulting in a rather concoluted definition of "order" that is not necessarily better and certainly not any more concise than the definitions taken from the philosophy of science which form the author's starting point. The next section deals with "Principles of order", providing a useful theoretical analysis of the basic principles on which ordered systems must rely, namely either serialization (and its varieties), and "grouping" or classification. The latter is dichotomized into "horizontal" or equivalent grouping, and "vertical" or hierarchical grouping of entities.

The heart of the chapter is the section on "Orders and ordering systems" in which the author develops a model of four fields arranged as quadrangles around a central core of ordering principles, namely: (A) Linear order; (B) Ontological-topological order; (C) Relational or hierarchical order; and (D) Teleological-correlative order. Field A comprises alphabetical, chronological or numerical order; field B is the domain of equivalent order; field C is the one of hierarchical or generic order; and field D contains what the author calls categorial or perspectivic order, the latter being a combination of functional and relational factors applied to the orderly arrangement of entities, showing their relations not only within one hierarchy but also those to other hierarchies as perceived from a particular functional point of view.

The last section of the chapter deals with problems of ordering in the documentation process, i.e. with the functional applications of various systems. While the theoretical explication of principles and types of orders