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# Functional Classification. I

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Reviews the problems and possibilities of classing the 20 000 international bodies and treaties described in the *Yearbook of International Organisations* as well as their preoccupations in the form of "World Problems", disciplines and occupations described in the *Yearbook of World Problems and Human Potential* (9 000 entries). Describes the design considerations for an alternative approach as compromise between the practicalities of directory production, facilitation of classification experiments, and an emphasis on incorporating richer patterns of relationship between activities to facilitate understanding of functional interjections.
The first approach was developed from *I.Dahlberg's* ICC scheme modified in the light of insights from the periodic classification of chemical elements. The result is compared to a presentation of interrelationships of different levels of inquiry and modes of experience arising from a study by *Eric Jantsch*. The resulting experimental matrix of codes (to be discussed in the second part of the article) was used to class titles by computer which were published in *Global Action Networks*, classified directory by subject and region (Vol.3 of the *Yearbook of International Organizations*). (Author)

## 1. Introduction

The Yearbook of International Organizations (Volume I) now describes or lists nearly 20 000 bodies which can in some way be considered international organizations. Whether governmental or nongovernmental, their activities interweave in a myriad ways in the processes of the international community. Although a 500 page multilingual index has been provided to those organizations in the Yearbook (Volume I), including keywords in their names, this nevertheless fails to provide an ordered, comprehensible overview of how such activities interrelate. In the absence of any such ordering, tendencies to fragmentation are reinforced and subtler approaches to integration are hindered.

This paper clarifies this challenge and describes the factors entering into the design of the process from which the activity classification for this volume emerged as a *first* product. It is important to note, as is explained below, that it is unnecessary to read or agree with the contents of this paper in order to derive *practical* benefit from the classification in its present form. The concern of this paper is to point out other ways of making use of the classification and the possibilities for its *further development*.

* This paper was first presented in an outline form to the 5th Network Meeting of the Goals, Processes and Indicators of Development project of the United Nations University, Montreal, 1980 (1). It was later presented in an amplified form to a sub-group of that project Athens, 1982 (24).
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### 1.1 Review of classification of organizations in the Yearbook of International Organizations

When the predecessor of the *Yearbook of International Organizations* was first produced in 1910, the organizations were classified in it according to the Universal Decimal Classification (UDC) system. This was to be excepted given that the person co-responsible for both the UDC and for the organization publishing the *Annuaire de la Vie Internationale* (as it was first known) was Paul Otlet, often referred to as the „father of international documentation". In 1910, on the occasion of the 1st World Congress of International Associations, he produced a „Tableau de l'Organisation Internationale" grouping organizations (and conferences) by subject area. An improved version of this was produced in 1924 by him, on the occasion of the 4th Conference of International Associations, covering some 400 international bodies with comments on their activities (2). The practice of using the UDC for classifying international organizations in its archives was in fact continued up until 1960 by the Union of International Associations.

The use of the UDC proved however to be too cumbersome for the organization of the *Yearbook of International Organizations* after its resuscitation in 1949. Between 1951 and 1965 (10th edition), organizations were grouped into some 20 subject chapters and allocated a simple filing number for indexing purposes. The number changed from edition to edition as a result of additions. Intergovernmental bodies were grouped in a separate non-subject chapter. This system proved progressively less satisfactory due to the emergence of organizations which could be usefully allocated to more than one subject chapter.

In the 11th and 12th editions the organizations were ordered alphabetically in an encyclopaedia format. A systematic permanent numbering system was maintained in parallel as a development of the earlier subject division. The approach created filing problems so that, in anticipation of the conversion to computer processing, organizations were given a permanent filing number from the 13th edition (1970–71). The subject-based numbering was abandoned from the 14th edition. The original subject "chapter" division was however maintained, with some additions, until 1980, in order to ensure statistical continuity. But from the 15th edition (1974) such statistics proved increasingly suspect due to the problem of overlap betweeen categories and despite the introduction of "secondary" classifications. It was recognized that a totally different approach would have to be used.

### 1.2 Review of other approaches to international organization classification

The Union of International Associations is obviously not the only body faced with the problem of classifying international organization activities. In searching for better approaches it is therefore important to take into account other initiatives, even if their focus is not solely concerned with international organizations.

Of greatest potential value is the *Macrothesaurus; a basic list of economic and social development terms* (3). This was published in 1972 by the Organization for Economic Cooperation and Development (OECD) in collaboration with other bodies, including the FAO and the ILO. Unfortunately its value is limited by the range of subjects indicated by its sub-title. It is however adapted to computer processing and exists in a multi-lingual version. It uses a 6-digit subject code.

Also of great potential value is the initiative of the International Federation of Documentation (FID), under contract to UNESCO, to design a *Broad System of Ordering* (4). This is known as BSO and reflects FID's experience as the agency responsible for the UDC. The BSO was intended as the basis for interconnecting information systems within the framework of the Intergovernmental Programme for Co-operation in the Field of Scientific and Technological Information (UNISIST). The most recent draft was published in 1978. It has met with severe criticism and is not particularly well-designed for computer processing. In addition, as might be expected from the priorities of UNISIST, the range of subjects does not respond to the detail or variety encountered in the *Yearbook of International Organizations*.

Simpler in many respects, and therefore of greater practical value, is the inter-organizational exercise within the United Nations system carried out by the Inter-Organization Board for Information Systems (IOB) with the approval of the Administrative Committee on Coordination (ACC). This resulted in the production of a list of *Broad Terms for United Nations Programmes and Activities* in 1979 (5). The 2,500 terms are grouped in 16 activity divisions defined at this stage by a 3-digit code permitting further development. The difficulty here is that the system does not appear to have been further developed and does not yet respond to the variety encountered in the Yearbook, especially as reflected in the concerns of nongovernmental organizations.

Also of great interest as a practical approach is the technique used by the publishers of commercial subject directories for multi-lingual users. An example is the "yellow page" directory produced for Belgian telephone subscribers. Subjects are given a 4-digit numeric code which does not however have any classificatory significance except to provide a numeric sequence. Separate indexes in English, Flemish, French and German enable users to locate each subject.

It is significant that none of the above initiatives is especially concerned with the pattern of relationships between activities or subjects. The allocation of numbers to activities is basically arbitrary. The project of Ingetraut Dahlberg, Editor of the journal *International Classification*, resulting in the production in 1981 of an *Information Coding Classification (ICC)* system (6), therefore merits special attention in a following section. One of its advantages is the use of a 4-digit code. But one difficulty in relation to this project is that the schedule of terms has so far only been published for 3-digits, raising problems in handling other topics with which international bodies are concerned.

### 1.3 Possibilities of an alternative approach

Serious attempts were made to use several of the above schemes in the period 1979–81, either singly or in combination. For a variety of reasons they proved impractical. The decision was therefore made to design a new scheme adapted to the problem of handling international organizations and their activities.

Once this decision was taken it created the opportunity of responding to many of the less apparent constraints encountered when attempting to use the above schemes. These have been discussed in a separate paper on anti-developmental biases in thesaurus design (7), on the occasion of a conference initiated by the Committee on Conceptual and Terminological Analysis (COCTA).

### 1.4 Preliminary design considerations

The point of departure was the system, mentioned above, developed by Ingetraut Dahlberg, following proposals first made by her in 1971. The general outline of her ICC scheme may be seen from Figure 1.

The following features of the scheme are of special interest:

- it is based on a concern for "man's ability to perceive the world, and to construct a system of knowledge units to facilitate his understanding of the world and communication about its nature" (8, p.6)
- it recognizes that the "structuring of man's knowledge about the world may be seen as being related to the ontical levels of general, world-immanent objects by an evolutionary sequence which however, is of a spiralling rather than of a linear nature" (8, p.7)
- it is ordered *vertically* in terms of 9 ontical levels associated with a progressive complexication of perceived reality:
  1. Pure forms and structures (magnitudes, proportions)
  2. Pure matter and energy (atoms, forces, etc.)
  3. Aggregated matter in motion (cosmic bodies, earth)
  4. Animated, non-intelligent beings (microorganisms, plants, animals)
  5. Animated, intelligent beings (individual human beings)
  6. Aggregated, intelligent beings (human societies)
  7. Material products (goods and services)
  8. Intellectual products (science, documents, information)
  9. Spiritual products (language, works of art and other metaphysical works) (8, p.35).

  These are distinguished by the *first digit* of the ICC code
- it is ordered *horizontally* from the non-fundamental disciplines at each level (on the left) to those concerned with application of that knowledge (on the right). These are distinguished by the *second* digit of the ICC code
- *within* any area of the resulting matrix, a structured sequence for the system positions was applied for the repeatable arrangement of the elements of each group. These are defined as follows:
  1. General and theoretical statements (axioms, etc.).
  2. Object-related statements (elements of objects, parts, kinds of object, etc.).
  3. Activity-related statements (states and processes in objects, operations applied to them, etc.).
  4/6. Statements related to specialities of the objects and/or activities concerned in 2 and 3.

Fig. 1: Subject groups according to generality areas

| AREAS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1 FORM & STRUCTURE AREA | 11 Logic | 12 Mathematics | 13 Statistics | 14 Systemology | 15 Organization | 16 Metrology | 17 Cybernetics (Contr. & automat.) | 18 Standardization | 19 Testing & monitoring |
| 2 ENERGY & MATTER AREA | 21 Mechanics | 22 Physics of matter | 23 Gen. & tech. physics | 24 Electronics | 25 Physical chemistry | 26 Pure chemistry | 27 Chemical technol. & engg. | 28 Energy sci. & technol. | 29 Electrical engg. |
| 3 COSMO & GEO-AREA | 31 Astronomy & astrophysics | 32 Astronautics & space research | 33 Basic geosciences | 34 Atmospher. sci. & tech. | 35 Hydrospher. & oceanol. sci. & tech. | 36 Geological sciences | 37 Mining | 38 Materials sci. & metallurgy | 39 Geography |
| 4 BIO-AREA | 41 Basic biol. sciences | 42 Microbiology & cultivation | 43 Plant biology & cultivation | 44 Animal biology & breeding | 45 Veterinary sciences | 46 Agriculture & horticulture | 47 Forestry & wood sci. & technol. | 48 Food science & technol. | 49 Ecology & environment |
| 5 HUMAN AREA | 51 Human biology | 52 Health & theoretical medicine | 53 Pathology & medicine | 54 Clinical medicine & cure | 55 Psychology | 56 Education | 57 Profession, labor, leisure | 58 Sports | 59 Household & home-life |
| 6 SOCIO-AREA | 61 Sociology | 62 State & politics | 63 Public administration | 64 Money & finances | 65 Social aid, social politics | 66 Law | 67 Area planning, urbanism | 68 Military sci. & tech. | 69 History |
| 7 ECONOMICS & TECHNOLOGY AREA | 71 Gen. & natl. economics | 72 Business economics | 73 Technology in general | 74 Mechanical & precision engg. | 75 Building | 76 Commodity sci. & technol. | 77 Vehicle sci. & technol. | 78 Transport, technol. & services | 79 Utilities & service econom. |
| 8 SCIENCE & INFORMATION AREA | 81 Science of science | 82 Information sciences | 83 Informatics, computer sci. | 84 Information in general | 85 Communication sci. | 86 Mass-communication | 87 Printing & publishing | 88 Communication engg. | 89 Semiotics |
| 9 CULTURE AREA | 91 Language & linguistics | 92 Literature & philology | 93 Music & musicology | 94 Fine arts | 95 Performing arts | 96 Culture sci. i. n. s. | 97 Philosophy | 98 Religion & secret teachings | 99 Christian Religion |



*Figure 1: Matrix organization of subject fields (Reproduced from I Dahlberg, reference 6)*

7. Statements on influences onto 2 and 3 from outside ("instrumental", technical relationship).
8. Statements on the use of 2 and 3 in other fields ("potential", resource orientation, application relationship).
9. Statements of the knowledge about 2 and 3 in distributing it by human beings, societies, documents, etc. ("actualization", synthesizing, environmental relationship).

These are distinguished by the *third* digit of the ICC code.

Dahlberg has elaborated, published and applied the scheme (6) using three digits (some 700 classes) and expects to publish a more extended four-digit version (some 7000 classes) in 1985 (9).

If the four-digit version had been available it is probable that it would have been used to design the coding system for international organizations. In experimenting with the various possibilities however it became apparent that there was a basic awkwardness and bias in making all the preoccupations of such bodies subservient to "knowledge" of "objects". This problem is particularly striking when a social reality like "homelessness" is classified under an intellectual discipline, namely "sociology", as in the case of the *UNESCO Thesaurus* (10). Similarly a value and condition of fundamental importance like "peace" is classified under an intellectual discipline such as "political science", or again "friendship", "love" and "hatred" are classified under "psychology".

Positioning values, conditions and forms of praxis in this way can be seen as reinforcing the dominance of the knowledge function during a period when the international community recognizes a need to enhance action, the "will to change", as well as the emergence of new values. Many organizations perceive themselves as concerned with praxis and do not relate directly to the intellectual disciplines by which their actions are supposedly governed according to university faculties.

In the light of the ICC scheme the question then became one of de-emphasizing this bias in favour of knowledge, whilst at the same time respecting the concerns reflected in the ordering of the matrix. One criterion of an interesting matrix, for example, would be the possibility of mapping onto it at different locations the various agencies and institutions required for the "operation" of a country or the world (e.g. various government ministries, hospitals, factories, farms, airports, military bases, etc.). In this way the matrix would become a tool reflecting *operational reality* to a greater degree, rather than responding primarily to the difficulties of designing information retrieval systems to facilitate research and the generation of further knowledge.

Another valuable feature of such a matrix would result from ensuring that it told a *developmental "story"*. This feature is to some extent present in the ICC matrix in that the "lower" ontical levels reflect the earlier phases in an evolutionary process, whilst the "higher" levels reflect the relatively recent phases of civilization. But it is possible that a more interesting developmental story (or stories) could be embedded in the structure of the matrix. This would be especially valuable if it highlighted the stages at which different functions emerged in society (e.g. social organization, mutual care, shelter, artefact construction, etc.). As argued in an earlier paper (7), this implies a dynamic *emphasis on processes* in contrast to the conventional static emphasis in classification schemes on states and objects. A number

of authors are now arguing against the insidious effects of static (Euclidean, Newtonian, Cartesian) descriptions of reality as favoured by the "Western" mode of thought (11, 12, 13). It can certainly be argued that this emphasis undermines a dynamic approach to development (7).

Clearly the above features would emphasize the "interweaving" of the cells of the matrix. This approach is to be contrasted with the practice adopted in the design of many thesauri. So little attention is devoted to the relationship between major classes that it is easy to get the impression that any such relationship is totally arbitrary – isolated subject clusters ("science", "religion", "art", "commerce", etc.) denoted by digits from 1 to 9, etc. The "lumping" of *major* classes together in this way does not appear to have changed significantly throughout the history of classification schemes from 1200 BC to the recent initiatives of the intergovernmental community (17). It is not difficult to argue that it is this arbitrariness which deprives the pattern of classes of any significance as a whole. As such it reinforces the fragmentation of society which many authors have deplored, as well as undermining any efforts towards an "integrated", "interdisciplinary" or "holistic" pattern of action (11).

### 1.5 Insights from periodic classification

As a guide to further insights for the design of a more interesting solution, what appeared to be required was some matrix-type model incorporating developmental features reflecting the emergence of a series of qualities organized into corresponding "groups" at a succession of "levels". The richest conceptual scheme of this kind appears to be the periodic table of (chemical) elements. The possibility of generalizing this periodic system seems first to have been explored by Edward Haskell (15). Inherent in such a scheme are many interdependency relationships. Furthermore, in comparing W.J. van Spronsens's history of the development of the periodic classification system (16) with that of Shamurin's history of the development of the classification of knowledge in general (14), it is possible to conclude that a scheme such as that of Dahlberg corresponds in structure to the penultimate development phase prior to the emergence of the fully fledged periodic system. Many conventional classification schemes correspond however to much earlier phases in this development with only rudimentary relationships between major classes.

In considering the possibility of such a fully-fledged periodic system, it is useful to bear in mind the following remark by A.J. Ihde in the foreword to van Spronsen's survey:

> "Facts soon reach a point where they become less and less manageable unless an attractive and meaningful system of classification is brought into being... Equally important is the role of tools in science... It is frequently not recognized that tools may be conceptual as well as physical... The Periodic System has fulfilled both of these roles. It has served as a classificatory device but it has contributed much more than mere classification. It has been a conceptual tool which has predicted new elements, predicted unrecognized relationships, served as a corrective device, and fulfilled a unique role as a memory and organization device. The periodic table has contained an innate flexibility which has prevented it from becoming frozen into a rigid structure. It lends itself to a large variety of forms. Although many of these are unique only as schemes representative of the author's originality, certain forms have unique value in bringing out particular relationships." (16, p. ix).

On this last point it is striking to compare the range of experiments with spirals, tables, circles, cones, cylinders and other figures in portraying the classification of elements (16) against the seemingly universal preoccupation with simply structured lists in the case of the classification of knowledge (14). In this sense the Dahlberg scheme is indeed an exception.

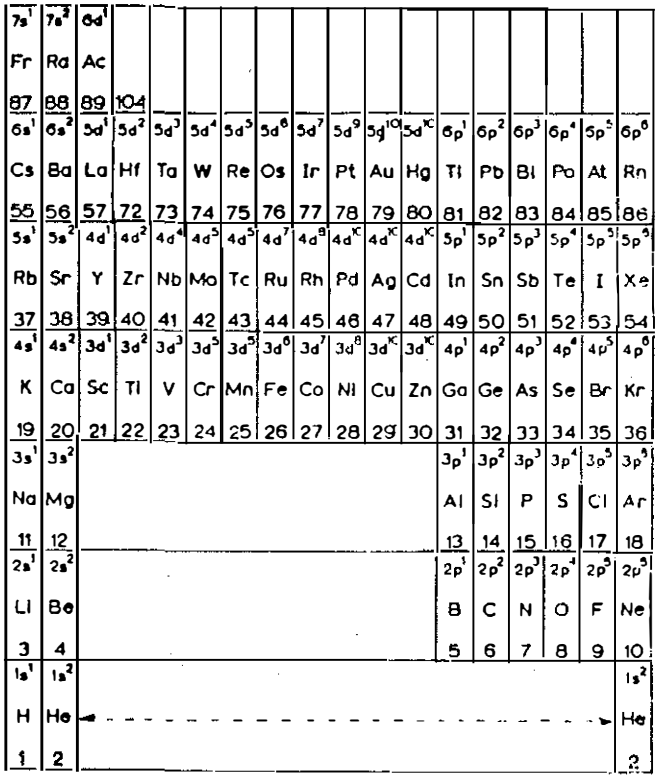


*Figure 2: Conventional presentation of periodic table of chemical elements (inverted and with "lanthanides", 58–71, "actinides", 90–103, not shown)*

To clarify the discussion it is useful to note how one frequent form of the periodic table (Figure 2) can also be presented in another way (Figure 3) which resembles more closely Dahlberg's ICC scheme. The "groups" of chemical elements then tend to appear in columns, analogous to those denoted by the ICC second digit. The transformation from Figure 2 to Figure 3 clarifies the distinction between two "sub-groups". This is even clearer in a circular form of the table (Figure 4).

## 2. Design considerations

The design envisaged is perceived as a compromise between three major "orientations": production of a practical classified directory; facilitation of experiments on classifications to develop improved versions; and an emphasis on incorporating richer patterns of relationships between activities to facilitate understanding of functional integration. These are detailed separately below.

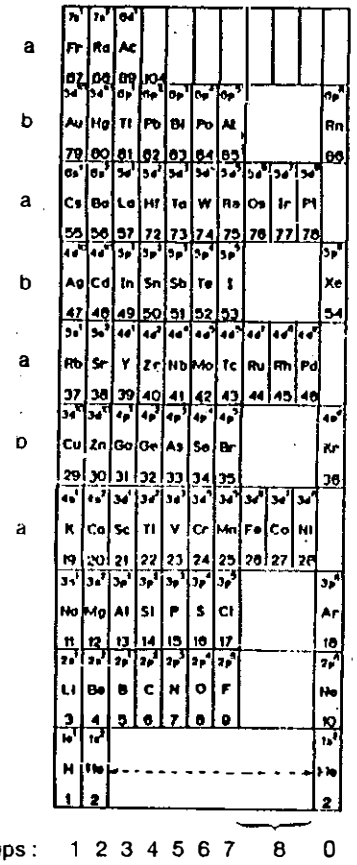


*Figure 3: Alternative presentation of periodic table of elements highlighting chemical groups ("lanthanides" and "actinides" not shown)*

### 2.1 Practical orientation

In the light of the above survey, the factors affecting the design of a practical system may be summarized as follows:

- it should respond to the progressive increase in number of organizations with multi-subject concerns;
- it should meet the need for a relatively simple classification scheme;
- is should facilitate incorporation of changes in organizational activities with the emergence of new issues (environment, energy, etc.);
- it should avoid the production delays associated with conventional methods of classification, particularly with increasing numbers of organizations and with the change in their concerns;
- in order to facilitate solutions to the above problems, it should use an approach which could be assisted by computer techniques as much as possible;
- finally, and perhaps of greatest importance, it should result in the production of a practical directory which avoids confronting the average user with levels of significance or complication not required, even though these features may be present for those who wish to benefit from them.

### 2.2 Experimental orientation

In contrast to most current classification systems, the design should facilitate classification experiments in the light of the following factors:

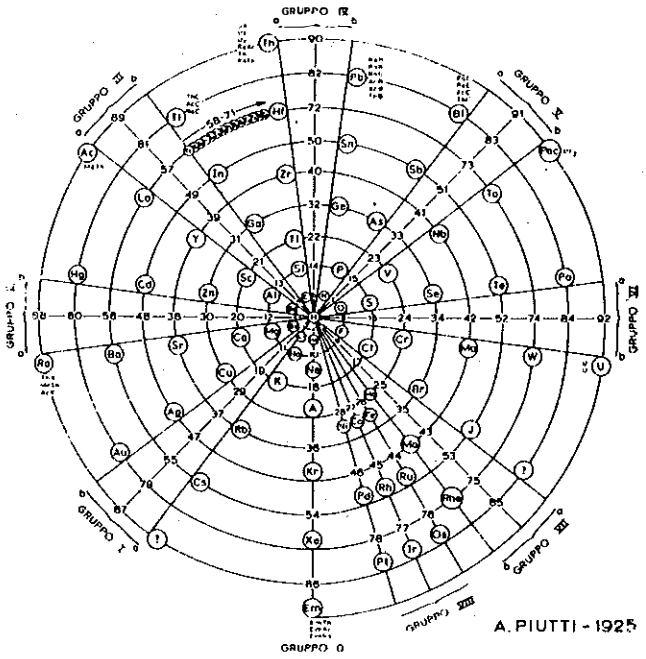


*Figure 4: Circular presentation of periodic table of chemical elements*

- it is not intended to produce immediately a "definitive" classification scheme for international organization activities;
- it is expected that different approaches will be explored from edition to edition, possibly with several approaches in one edition;
- the position of classes or sub-classes in any one matrix pattern may be adjusted between editions in the light of the results to which it gives rise when tested on the range of international organization activities;
- it is expected that refinements to the computer programmes used will lead to more valuable versions of the scheme;
- the flexibility necessary for such an experimental approach should be achieved by computer-assisted methods of reclassifying the complete range of organizations whenever a new version of the scheme is required;
- as an experimental system, risks will necessarily be taken which may give rise to errors, but every effort will be made to minimize their significance for users interested only in the pratical value of a given classification scheme.

### 2.3 Pattern building orientation

The experiments in classifying international organization activities will be carried out to highlight significant patterns of relationships between them in the light of the following factors:

- the emphasis is less on possible bilateral relationships between any two subject areas (e.g. medicine and sport) as on portraying the complete range of classes in some functionally meaningful pattern of relevance to organization activities;
- the intention is to explore ways of ordering the classes within as many simultaneously interweaving patterns as proves feasible;

– in developing such patterns a major constraint is that of maintaining and improving the comprehensibility of any such scheme.

## 3. Design Procedure

The design for the current edition resulted from the interaction between the following steps or approaches.

### 3.1 Activity word list

Given that the preoccupation of international organizations extends beyond the ranges of the specialized thesauri noted above, one point of departure was to extract (by computer) all significant keywords from the names of organizations listed in the current edition of the *Yearbook of International Organizations*. This resulted in some 8900 words after suppression of prepositions, etc. To these were then added words extracted from an earlier multi-disciplinary publication, the *Yearbook of World Problems and Human Potential* (17), resulting in a total of some 11,000 words. A particular merit of this list is its comprehensive coverage of active concerns of the international community, whether problem, discipline or value oriented. The computer system is designed so that this list can be re-extracted at any time to capture new words associated with new organizations or preoccupations.

### 3.2 Interrelating major classes

The various international thesauri noted above were used to isolate major classes (e.g. science, religion, etc.) which have traditionally proved to be a practical basis for grouping concepts. Particular attention was however paid to "awkward" classes which did not fit naturally into such groupings (e.g. standardization, design, and systemology are treated as "general" or "interdisciplinary" classes in the case of the *Unesco Thesaurus*). Also of interest were classes that had for convenience been forced within other classes even though they represented a relatively distinct concern.

### 3.3 Elaborating a matrix of distinctions

Using the major classes derived above in the light of the variety reflected in the extracted word list, considerable time was spent in juggling items into some sort of matrix form. This process, as an exercise in design, was very much a blend of science and art as described in Christopher Alexander's *Synthesis of Form* (18). The matrix was not perceived as being a purely logical clustering of fields of knowledge but rather a pattern of activity domains in which the degree and quality of objectivity varied. The constraining factors which emerged as useful in this process include the following:

– entrapment in a purley linear sequence should be avoided by somehow including a non-linear patterning feature. This was achieved by considering neighbouring columns and rows of the matrix as functional complements of a mutually counterbalancing nature, rather than simply as members of a logically defined set.
– the cells of the matrix should be perceived as representing functional domains of which only some might have a cognitive emphasis. The words that could currently be placed "in" such a "semantic cell" do not therefore necessarily exhaust the meaning that may come to be associated with that cell. The words are indicators of significance but they do not delimit it.
– following Dahlberg's approach, rows of the matrix should be used to distinguish different functional "levels". The order is then such that the "lower" or more fundamental levels must first "emerge" prior to the "higher" levels for which they provide a foundation. The succession of levels thus constitutes a developmental sequence.
– at any given level, the cells of the row in question should represent a set of interdependent functional domains whose interaction is essential to the stability of that level. In effect the expression of one evokes the expression of the others.
– the ordering of the cells of the matrix, in the light of the previous points, should go some way towards reflecting the attitudes and behaviour of those associated with them as in: the "pecking order" of the sciences; the "non-scientific" nature of certain domains; the less "concretisable" charateristics of some domains.
– when appropriate, the order of the cells should reflect the order of "emergence" of functions, either as they become explicit in a community (in roles or programmes, for example) or as they can be explained in the stages of some coherent educational programme.
– in contrast with the usual practice in classification schemes, effort should not be directed to grouping everything associated with a given subject into a class which primarily reflects the expression of some intellectual discipline (e.g. political science, sociology). When appropriate, words associated with such distinct orientations as social praxis, material conditions, theoretical approaches, value expression and modes of awareness should be separated into different levels, although possibly in the same column. Thus "love", and "sex" should not necessarily be grouped under "psychology" (as is done in the *Unesco Thesaurus*).
– just as the previous point stresses the need to counteract the tendency in favour of a theoretical emphasis, so attention should be given to counteracting an antropocentric emphasis (e.g. "fish" as a sub-class of "agriculture" in the *OECD Macrothesaurus*) or a legalistic emphasis (e.g. "prostitution" as a sub-class of "crime" in the *Unesco Thesaurus*).
– distinction should be made between levels constrained by nature or by patterns of behaviour, others at which category boundaries are called into question, and those at which the initation of change or development is emphasized. This offers a means of separating functions concerned with analyzing or reacting to the human environment from those concerned with various forms of development, whether individual or social.
– with regard to the levels related to social praxis, the cells should each be associated with characteristic institutional features of society such as: government ministries or portfolios (in simpler and more developed administrations), university faculties, or functionally specific buildings (e.g. hospital, factory, military base, school, laboratory, etc.).

the size of the matrix needs to be constrained by its comprehensibility, as determined by man's difficulty in dealing with more than approximately seven categories unless extensive patterning features are incorporated as mnemonic coding devices (26). There is an obvious practical advantage in computer processing if the cells can be defined in terms of the decimal system, as in the case of Dahlberg's proposal.

although the pattern of matrix cells is conceived as being complete, the representation of the content of those cells should be open to continuing development. Thus the range of words reflecting the significance of each such cell may change (aside from the possibility that words may be allocated to more appropriate cells). In particular the cells corresponding to more existential or value-related concerns should be open to future clarification (possibly in the light of the very extensive Eastern reflection on such categories). As noted earlier, it is the words signifying dimensions awkward to associate with the earlier cells which raise the possibility that they should be associated with some other cell to which few words have been previously allocated. In this sense, it is the "earlier" portion of the matrix which is "complete", whereas the open-endedness is primarily associated with the "higher" levels.

The process of distinguishing qualitative attributes and their analogies to one another bears an interesting resemblance to the documented history of the manner in which chemical elements were slowly juggled into a meaningful periodic pattern (16). As in that case, part of the problem lies in the fact that words often refer to qualitative "compounds" of two or more elements although the distinction between an element and a compound may well be unclear.

## 4. Functional Self-Organization

With the switch in emphasis from pure classification to one in which functional relationships are to be highlighted, it is clear that any resultant matrix can usefully be compared with models of human social systems. One of the most interesting theoretical explorations of this kind is the investigation of Erich Jantsch as reflected in three volumes (19, 20, 21). The special merit of his approach is that it developed from an initial involvement in management, planning, systems and the policy sciences, subsequently to include non-dualistic insights and recognition of the significance of hemispheric specialization of the brain. In his final work (21), he provides a scientific foundation for a new world view which emphasizes process over structure, non-equilibrium over

| | | Rational level of perception/inquiry | | | Mythological level of perception/inquiry | | | Evolutionary level of perception/inquiry | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spiritual space | Policies | Iconological determinism | | | Imagination, creativity | | | Objective will, love | | |
| | Design concepts | Regulation, centering | | | Learning, hope | | | Paradigms (religions, ideologies) | | |
| | Norms | Regularities | | | Values | | | Purpose, faith | | |
| Social space | Policies | Social control, government | | | Participation, subjective will | | | Union, sharing | | |
| | Design concepts | Behaviour, system forces | | | Role-playing expectations | | | Normative ethics | | |
| | Norms | Behavioural patterns | | | Individual ethics | | | Ethics of whole systems | | |
| Physical space | Policies | Physical control | | | Environmental quality | | | Continuity of life | | |
| | Design concepts | Predictability | | | Interaction, possession | | | Harmony, aesthetics | | |
| | Norms | Measure | | | Quality, wholeness | | | Oneness | | |
| | | Right-brain | Integrated | Left-brain | Right-brain | Integrated | Left-brain | Right-brain | Integrated | Left-brain |
| Basic experience (= What we...) | Are | Creative (Being) | Self (Becoming) | Ego (Doing) | Drifting | Cybernetic actor | Homo faber | Empty channel | Evolutionary agent | Rebel (Prometheus) |
| | Feel | Instinct (Groundedness) | Continuation (Beauty) | Intellect (Mobility) | Compassion | Communication (Morality) | Rectitude | Eros | Communion (Truth) | Logos |
| | Perceive | Contents | Change | Form (Measure) | Gestalt (Quality) | Process | Structure | Attraction | Order of process (Evolution) | System |
| | Know | Visibility | Efficiency (Know-how) | Utility | Dynamic forces | Goals (Know what) | Connections | Flow, change of regime | Purpose (Know where-to) | Defined regime |
| | Want | Basic drives (Needs) | Possession (Static security) | Achievement of targets | Non-attachment | Expectations | Demands | Self-abandonment | Hope (Dynamic security) | Clarity |
| | Conceive | Conservation | Force (Replacement) | Progress | Adaptation | Roles | Investment | Finding | Syntony (Tuning-in) | Invention |
| | Cando | Instinctual response | Behaviour (learned response) | Leverage (Technology) | Receptivity | Action | Creativity | Inactivism (Man of Tao) | Regulation (Control of powers) | Activism (Don Quixote) |

*Figure 5: A presentation of interrelationships of different levels of inquiry and modes of experience (Adapted from tables of Erich Jantsch, reference 19)*

equilibrium, evolution over permanency, and individual creativity over collective stabilization.

Of special relevance is his elaboration of a number of tabular presentations which distinguish levels in a manner similar to that advocated here. For example, one table concerns "Multi-level planning in relation to a multi-level reality" in which the levels of planning correspond to different time horizons and different levels of logic and system paradigms. The five levels he distinguishes are: resources, products and services, social functions, policy and values (21, p. 268). In an earlier book he has tables organized in terms of areas of "basic human experience", namely what we: are, feel, perceive, know, want, conceive and can do (19, p. 235). Information from these tables has been combined into a modified presentation (see Figure 5).

Jantsch stresses the significance of the new area of systems thinking concerned with "self-organization" of human systems. In effect his tabular presentations may be considered as selforganizing patterns of functions. In the presentations in his books special stress is laid on the relationships between the elements of the table through feedback loops. It is in this light that it is valuable to explore the organization of the matrix discussed here. The emergence of classes in the matrix is in this sense an organic response to the macro-organization of the pattern. The process whereby major classes of functions emerge (e.g. "science", "education", etc.) in society is then a conceptual equivalent to "macron" patterning, as described by Ralph Abraham in one of Jantsch's books (22). Such new order emerges through fluctuation, and it is on the basis of such fluctuation that the system evolves. One of Jantsch's most important contributions is to draw attention to the relevance for social systems of Ilya Prigogine's investigations into this phenomenon (23). It is for this reason that it is considered desirable to build an element of fluctuation or alternation into the matrix pattern on which the classification is based (24, 25).

(To be continued in next issue)

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