

Some Kinds of Classification

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ARCHIVISTS encounter a great variety of filing schemes. Their profession is therefore in a good position to establish a typology of such schemes by application of comparative method. Encouragement to make the effort can be found in the successes of archeology in typologizing other cultural remains from times past, such as fist hatchets, pots, architectural forms, and artistic styles.¹ But alas, any effort of the sort runs into difficulties if it gets beyond recognizing a few simple-minded principles of arrangement and tries to analyze the basic possibilities of classification as something distinct from arrangement.

CLASSIFICATION AS DISTINCT FROM ARRANGEMENT

Arranging things involves placing them in relation to each other according to some purpose or plan. The activity is a physical one. It may or may not be orderly. In orderly arrangement the placement is made to correspond to some potential order-relationship inherent either in the things themselves or in means of denoting those things, such as words or symbols. Thus you can arrange soldiers according to their height, and you can arrange successive tones produced with a flute according to the placement of successive musical notes on a musical staff.

Classifying things involves assigning each of them to a class on the basis of the concept of that class being considered applicable. The activity is a mental one: the forming of an association in the mind. The class concept considered applicable must already have been formed. It is usually held in mind by association with some means of denotation, such as a word or symbol. It may also be held in mind by grouping together the things to which it is considered applicable. Otherwise it can be held in mind only with much difficulty.

Grouping things together physically for the purpose of holding a concept in mind or for other purposes of arrangement can follow so closely after formation or application of the concept that confusion of the mental operation with the physical operation is easy. The taproot of the possibility of confusion is the fact that classification in its most primitive form (that is, without the aid of applicable long-established concepts) is almost inseparable from actual or imaginary arrangement of things on the basis of similarities in characteristics. In the circumstances initial formation of the applicable concept may precede arrangement by an interval so short as to be almost inappreciable. There has to be an intervening interval nevertheless.

¹ What suggested the writing of this paper was reading a recent "little gem" of a book on archeology: James Deetz, *Invitation to Archaeology* (Garden City, N.Y., 1967).

TWO BASIC KINDS OF CLASSIFICATION

Every discussion of classification ought to begin by pointing out that there are two basically different kinds of activity to which the term "classification" is applied as the equivalent of the participial noun "classifying." In the one case things are assigned to tentative classes according to recognized similarities and differences without any conclusive assurance that the class concepts used are logically consistent. In the other case a concept of the totality of the things to be classified is broken down by logical "division" into subconcepts that are mutually exclusive at each level of breakdown. Classification of the first sort may be said to be *taxonomic*, while classification of the second sort may be said to be *dichotomic*. Each is the opposite of the other, but for purposes of precise definition it is perhaps best to indicate that taxonomic classification is the same as nondichotomic classification.

Neither form of classification results in a system of classes with a fixed sequence. If the classes that result are given a fixed sequence more or less arbitrarily, this sequence is normally held in fixation by establishing a correspondence between it and a symbolic notation having a fixed sequence. A classification of either sort may be said to be *seriated* if its classes have been given a fixed sequence; otherwise it may be said to be *unseriated*.

Taxonomic Classification

Taxonomic classification is rooted in human experience in sorting things out physically or mentally without preconception of the pattern of classes that would result. Biological taxonomy, from which the term taxonomic is taken over, provides a monumental exemplification of such sorting in its classification of life forms that have been discovered to exist. Most other extensive classification systems worked out by science are likewise taxonomic in origin. Such systems are usually sophisticated in the sense that theories of causation or other interrelation have been worked out to account for the raw results of classification and the raw results then modified in the light of the theories. But any explanation of why a certain pattern of classes fits certain phenomena does not affect the taxonomic character of the classification unless it may perchance permit the construction of a dichotomic classification of superior merit to supersede the taxonomic classification.

The curse of taxonomic classification is that things keep turning up that do not fit into any one of the "boxes" provided. Either a suitable box is lacking or the particular new thing belongs in more than one of the boxes provided. Thus some hard thinking would be required if you had to classify under either "implements" or "receptacles" such articles as a sieve, a soup ladle, a sprinkling can, a Molotov cocktail, and a rain gage. From time to time a whole taxonomic classification that was made from one point of view, such as concern with derivation,

may have to be drastically revised or even replaced to meet the needs of another point of view, such as concern with chemical composition. Something of the sort occurred in biology with the advent of the theory of evolution, for previous morphological classifications of plants and animals then had to be revised on a phylogenetic basis.

Taxonomic classification assumes, in folk application as well as application by science, that there is a decipherable orderliness in the universe and that separate establishment of a class may be simply the recognition of one element of such orderliness. Each separate establishment of a class is merely a hypothesis, of course, and may therefore be inconsistent with other such hypotheses. In fact, classes so established are so frequently inconsistent with each other that thinking may be handicapped or stultified by their being taken for granted.

Modern science is not much embarrassed on this score because it eliminates class concepts that do not meet the test of fitting to best effect into a whole system of associated concepts. Thus its classification of subatomic particles must as a whole fit the observed phenomena to best effect, and its class concept of any one type of particle must fit into the whole classification to best effect. Modern science has long since discarded most folk concepts about nature and therefore normally has to wrestle only with such inconsistencies of classification as it creates for itself. These are relatively few for the reason that modern science does not ordinarily establish a class concept separately; it establishes the concept in relation to the other concepts with which it will be associated. Indeed, what most characterizes modern science is that it has been engaged in constructing whole systems of specially designed class concepts to serve as models of some part of nature.

Dichotomic Classification

In contrast to taxonomic classification, dichotomic classification insists that classes not be established separately but as coordinate divisions of a higher class or of the universe of discourse. Each class so established is the contradictory class with respect to one other class so established or the combination of more than one other classes so established. The dividing into coordinate classes is called a dichotomy or polychotomy according to whether it produces only two divisions or more than two. Thus electricity may be divided by dichotomy into positive and negative (or nonpositive) electricity, while the hues of the spectrum may be divided by polychotomy into the four primary and various transitional colors. Since the divisions produced by any polychotomy could have been produced instead by a succession of dichotomies that might be called a "polydichotomy," the result of any intentional dividing of a whole into mutually exclusive classes or extents may be said to be *dichotomic* either literally or by synecdoche. In other words, the meaning of the term dichotomic is rigged here to cover not merely

the distinguishing of contradictory classes two by two but such other distinguishing of classes as could be accomplished in that way.

Dichotomic classification is explained in a general way in traditional logic as "division." The content of the explanation was something handed down from the *De Divisione* of Boethius (480?–?524) and the *Isagoge* of Porphyry (232?–?304), works which themselves regurgitated teachings of the earlier Alexandrian synthesis of Greek logical thought. This inherited Greek thinking about dichotomic classification has been found over the centuries to be almost useless for constructive as distinct from critical purposes.

The reason is that Greek logical thought was primarily concerned with use of ordinary language. It was concerned more particularly with the fallacies of reasoning in ordinary language, such as had been worked up into a technique of rhetorical trickery by the Sophists. For the effective criticism of such trickery the most powerful instrumentality was the syllogism as expounded by Aristotle. But the teachings about definition and logical "division" were developed to the same end. They were fairly well designed to ferret out inconsistencies in the use of terms by intellectual doubledealers and the inconsistencies inherent in the terminologies of ordinary language. They are of little value for the construction of concept systems purporting to be representative in some part of the organization of nature.²

What vitiates nearly all attempts at dichotomic classification is the difficulty in finding established terms for negative classes, one of which is produced by every dichotomy. Logicians may talk glibly of A and Not-A, but the practical classifier has to give these symbols content. Unfortunately, the vast majority of ordinary language terms are not precisely matched by contradictory ordinary language terms that are not negative but positive in their denotation. What positive term can you use as the contradictory of "empty" or "psychology" or "Europe"?

Ordinary language contains a good many opposed positive terms such as alive and dead, long and short, open and closed, buy and sell, but these are treacherous in frequently not being really contradictory. Ordinary language also contains a great many privative terms formed with prefixes such as *non-*, *a-*, and *un-*, but of such terms only those formed with the prefix *non-* can be relied on to be normally contradictory. If dichotomic classification tries to find matching contradictory terms

² Among philosophers of the present century F. C. S. Schiller has been notable for his forthright repudiation of the scholastic sophistry of our time, to which he applied the term intellectualism. According to Schiller logic is "neither a science nor an art, but a dodge." Of its theory of definition and division he said: "Not merely is it pervaded with difficulties and incongruities, not merely is it incapable of application and impotent to help science in dealing with real problems of definition and classification, but it is positively misleading and obstructive." See his *Formal Logic, a Scientific and Social Problem*, p. 15, 78 (2d ed.; London, 1931). Like most others Schiller does not seem to have appreciated that the Aristotelean organon makes sense only as a vehicle of argumentation and medium of destructive criticism.

that are not privative, it soon gets entangled in a thicket of different kinds of opposed meaning.³ If it tries to avoid such entanglement by making use of contradictory terms having a strictly negative form, it soon finds itself encumbered with class designations that are hard to comprehend because they contain multiple negations. The difficulty may be illustrated by offering for consideration an arbitrary class of substances that are nonorganic, nonfluid, nonelastic, nonmalleable, nonporous, noninflammable, nonlaminar, and nonvitreous.

The substitution of specially invented or peculiarly defined terms for class designations that are multiply negative, or for more than a few class designations that are simply negative, is ordinarily unacceptable to the adult mind. We may be willing to attend to a classification presented in terms that are individually familiar, but without some extraordinary incentive we will not undertake to drill ourselves in learning a strange new terminology as though we were memorizing for the first time the declensions and conjugations of Latin. The shutters of the mind are slammed shut, and that is that. Often the only incentive that leads to the mastering of strange new terminologies is the exultation obtainable by critics in holding up to scorn the pattern of ideas presented.

The practitioner of dichotomic or supposedly dichotomic classification whose work is held up to scorn can of course obtain compensation by applying logical "division" to the criticism of taxonomic classification schemes. If he works at it he should be able to show that any elaborate taxonomic scheme is riddled with logical inconsistencies and absurdities. Ability to do this must not be supposed, however, to carry with it superior competence for devising practical classification schemes.

SECONDARY KINDS OF CLASSIFICATION

Quasi-Dichotomic Classification

The fact must be faced that the distinguishing of taxonomic and dichotomic classification does not in itself represent much of a step toward establishing a typology of classification schemes. Such strictly dichotomic schemes as may be constructed are either so inelaborate or impractical that as a class they are not even remotely comparable as a constituent of culture with the class of existent taxonomic schemes. Indirectly, however, the distinguishing of dichotomic classification can be helpful in typologizing taxonomic classification schemes. Some of these can be said to be *quasi-dichotomic* because each represents a more

³ See the discussion by Rose F. Egan under the heading "Antonyms: Analysis and Definition" in the introduction to *Webster's Dictionary of Synonyms*, p. xxviii-xxxii (Springfield, Mass., 1942). It is interesting to compare her observations with what Paul M. Roget had to say in 1852 in the introduction to his *Thesaurus of Words and Phrases* about "words expressing opposite and correlative ideas." Note may be taken of the fact that the relatively young and iconoclastic science of linguistics eschews any attempt to do better than Roget in providing a systematization of the concepts represented by the words of a language.

or less unsuccessful effort, conscious or unconscious, to construct a dichotomic classification.

Hierarchical Classification

Any dichotomic or quasi-dichotomic classification with more than one level of breakdown has a form that is said to be *hierarchical*. This term signifies that there is some division of classes into subclasses and that the level of each such division is fixed. Thus schoolchildren may be hierarchically classified by grade and then by sex but not also in the same classification by sex and then by grade. Hierarchical form does not mean that classes and subclasses have a fixed sequence,⁴ for any choice of one permutation of them out of the many usually possible is always arbitrary, except for the requirement that any subclasses of a class be listed immediately after that class.

There are of course dichotomic and quasi-dichotomic classifications that are *nonhierarchical* in form because they are without any division of classes into subclasses. Classifications that are neither dichotomic nor quasi-dichotomic may also have nonhierarchical form. However, all classifications having hierarchical form are either dichotomic or quasi-dichotomic by definition.

Since strictly dichotomic classification schemes cannot easily be elaborated without loss of practical utility, most hierarchical schemes that are patently such or relatively well known are quasi-dichotomic in character. Their departures from being strictly dichotomic are obscured, however, by their form. This regularly presents the breakdown into main classes and into subclasses of any class as though it were a polychotomy rather than a succession of dichotomies. The main classes of the Dewey decimal classification might be considered in this connection. It can be instructive to represent these as though they had been produced by a succession of dichotomies.

Creators of hierarchical classification schemes all face the practical necessity of using established terminology, although such terminology, outside perhaps of some areas of science, is a riotous growth incapable of any rigorous logical reconciliation with itself. An extensive hierarchical classification scheme cannot be both strictly logical and easily intelligible. All such schemes are therefore illogical and unintelligible to a degree, and the degree increases with the extent of their elaboration in detail and of their continuation in use as terminologies undergo marked change.

Seriated Hierarchical Classification

If the classes and subclasses of a hierarchical classification have been established in a fixed sequence, the seriation is commonly indicated by

⁴ Confusion on this point is sometimes encountered in the literature on classification produced by librarians and documentalists. The confusion arises from habitually thinking of

providing them with letter and/or digit symbols that have the desired sequence inherently. These symbols also offer the advantage that by means of them the classes and subclasses of the scheme can be represented more compactly than by their terminological designations.

When a hierarchical classification scheme has been seriated by application of a symbolic notation, the merits of the scheme are seldom separated from the merits of the notation in the mind of anyone evaluating the combination. Most likely, the combination will be judged by the merits or demerits of the notation. Such is the case undoubtedly with the persistently popular Dewey decimal system of classification.

It needs saying, therefore, that the theory of classification ought to be kept distinct from any consideration of ancillary schemes of notation. In this connection the point may well be made again that hierarchical form does not mean that classes and subclasses have a fixed sequence. So far as the theory of classification is concerned the main classes of a hierarchical classification can be taken in any order, as can also the subclasses of any class. It is only for the purpose of applying the classification to the physical arrangement of things that its headings need to be taken in a fixed order.

Diversiform Classification

Classification may be said to be *uniform* if it is either dichotomic or quasi-dichotomic.⁵ Otherwise it may be said to be *diversiform*. This distinction serves to dichotomize taxonomic classification into quasi-dichotomic (uniform taxonomic) and diversiform classification. (The latter is itself divisible into *systematic cross-classification* and *lexic classification*, which are discussed below.)

Diversiform classification differs from uniform classification in two respects. First, cross-classification is included as something acceptable rather than as a defect. Second, levels of breakdown by particular principles of division are not fixed. Class concepts therefore often intersect even when they do not stand in the relation of genus and species. For this reason diversiform classification most typically provides multiple class assignments for an item rather than a single class assignment. Since multiple class assignments cannot be reflected in a sequential arrangement of things of which only single exemplars are available, diversiform classification generally does not provide a satisfactory basis for combining classification with arrangement.⁶ Its utility is therefore largely

hierarchical schemes as having a notation that establishes a fixed sequence of classes and subclasses.

⁵ This applies to classification as a process. Actual classification schemes, if at all complicated, are seldom *strictly uniform*. They may be *basically uniform* and *incidentally diversiform*, or they may be *basically diversiform*.

⁶ The British special library practice of using classified catalogs permits one of a number of class assignments to be used for the filing of the given item. In such case the class assignment used serves much the same purpose as a serial number unless multiple class assignments are largely avoided at the expense of adequate diversiform classification.

confined to cataloging and indexing, where multiple entries are readily practicable.

Systematic Cross-Classification

Some taxonomic classification is diversiform rather than uniform for the reason that it provides alternative sets of classes at some or all levels of breakdown, each such set being formed by what purports to be a dichotomy or polychotomy of the universe of discourse upon a different principle of division. Thus schoolchildren may be alternatively classified at the same level of breakdown by sex, age, race, grade, economic status, or the like. The choice would normally depend on what was considered to be the subject interest of what was being classified.

Concurrent use at the same level in classification of alternative sets of correlative classes constitutes a kind of cross-classification. Since instances of cross-classification can also occur as defects in classifications that are intended to be dichotomic or quasi-dichotomic, it is necessary to distinguish as *systematic cross-classification* the purposeful and regularized use of cross-classification in the manner just indicated. Cross-classification of the other sort can then be designated as *unsystematic cross-classification*.

A comprehensive scheme of systematic cross-classification may be seriated or unseriated. If seriated, its systematic character may not be apparent. Seriated systematic cross-classification is ordinarily called "faceted classification" in Great Britain, where interest in it has flourished. This designation is taken from the exuberantly metaphorical jargon of bibliothecal and bibliographic classification theory worked out by the Indian librarian, S. R. Ranganathan. In this country systematic cross-classification is seldom more than part of the total pattern of a diversiform classification but it may be thought out with no less care.

Systematic cross-classification can be combined in varying degrees with dichotomic or quasi-dichotomic classification and usually is so combined in pretentious hierarchical schemes such as those of Dewey and Bliss and the Universal Decimal Classification. This does not materially affect the fact that in each case the basic structure of the scheme represents an attempt to set up a uniform classification. The not infrequent occurrence of incidental cross-classification does, however, contribute to the difficulty of distinguishing in practice, and talking about in theory, the various kinds of classification.

Lexic Classification

Diversiform classification that is not systematic cross-classification may be said to be *lexic*, since its most familiar manifestation is to be found in language vocabularies. Until recent years classification of the sort here in question has not been thought of very much as classification because it has been buried under the alphabetical arrangement of dic-

tionaries, dictionary catalogs, and indexes. In dictionaries the classes recognized are represented by vocabulary entries or subentries; in catalogs and indexes they are represented by subject headings and subheadings.

What is fundamentally distinctive about lexic classification is that it forms class concepts—not by breakdown of a universe of discourse, but by subsumption of mental constructs of a lower order, be they concepts, percepts, or raw sensations. Since it most typically forms class concepts by mental processes that are independent of each other, the results obtained are commonly not interordinate, that is, commonly not either coordinate or in the relation of genus and species or in a relation combining these two kinds of relation. The results obtained are also not typically fixed in level, for the order of succession of subsumptions can be changed to produce different results at given levels. Unsystematic cross-classifications typically abound. To complicate matters further, class concepts formed by subsumption are frequently subjected to logical breakdown into subconcepts other than such as they may have subsumed.

The total pattern that emerges from lexic classification on a large scale might be characterized somewhat tropologically as “chaotic organization of chaos.” Yet selection of class concepts produced by lexic classification is the main basis on which nonlexic classifications are constructed. Indeed, one way to think of lexic classification in general is to conceive it as having produced most of the class concepts that may be organized by other forms of classification. It accounts for most of the growth of ordinary and scientific language.

Lexic classification may or may not be attended by an effort to reduce redundancy and inconsistency among class concepts produced or utilized. In the one case lexic classification may be said to be *controlled* and in the other case *uncontrolled*. This distinction is not of much practical utility, however, because conscious practical concern with lexic classification entails exercise of some degree of control over the process or result. Uncontrolled lexic classification is exemplified mainly in the results of language growth, which constitute the medium in which all controlled classification must have its being.

Controlled lexic classification usually manifests itself in the production of lists of subject headings and dictionaries or thesauri of terms admitted into contrived special languages for particular purposes in view. In this country efforts to develop “nonconventional” methods of cataloging, indexing, and classification capable of handling varying combinations of more than a few class concepts have been rooted partly in experience with long-established methods of subject cataloging and partly in American love of gadgetry. They have therefore shown a pronounced predilection for resort to controlled vocabularies and mechanical manipulation of concept combinations. This is in contrast with the tendency

in Great Britain, where analogous efforts are rooted in technological conservatism and experience with classified catalogs. The British predilection has been for seriated systematic cross-classification.

CONCLUSION

Full discussion of kinds of classification has not been practicable within the limits of this article, nor has it been practicable to refer to pertinent parts of the turgid outpouring of literature on the signs and wonders manifested since World War II in the relatively new field of documentation science and technology. A lot of sound and fury about the pragmatics of classification has actually not produced much contribution "for the ages" to the literature of its pure theory.

The following tabulation of the kinds of classification that have been distinguished here may serve a good purpose in presenting a challenge for someone to come up with something better:

KINDS OF CLASSIFICATION

DICHOTOMIC (uniform)

Hierarchical or nonhierarchical

TAXONOMIC (nondichotomic)

Quasi-dichotomic (uniform)

Hierarchical or nonhierarchical

Diversiform

Systematic cross-classification

Lexic classification

Uncontrolled

Controlled

This sort of "classification of classifications" ought to be useful in the typologizing of actual classification practices in their historical and cultural contexts. It obviously does not in itself provide any part of a typology of such practices, however. Until its possible usefulness in that direction can be somehow realized, either directly or in provoking thought about kinds of classification, it mainly serves to particularize what was meant by the statement made at the end of the first paragraph of this article, to the effect that anyone who starts trying to think cogently about kinds of classification soon finds himself in difficulties.

SAA SPRING LUNCHEON

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DR. KATHERINE DRAKE HART, SPEAKER

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