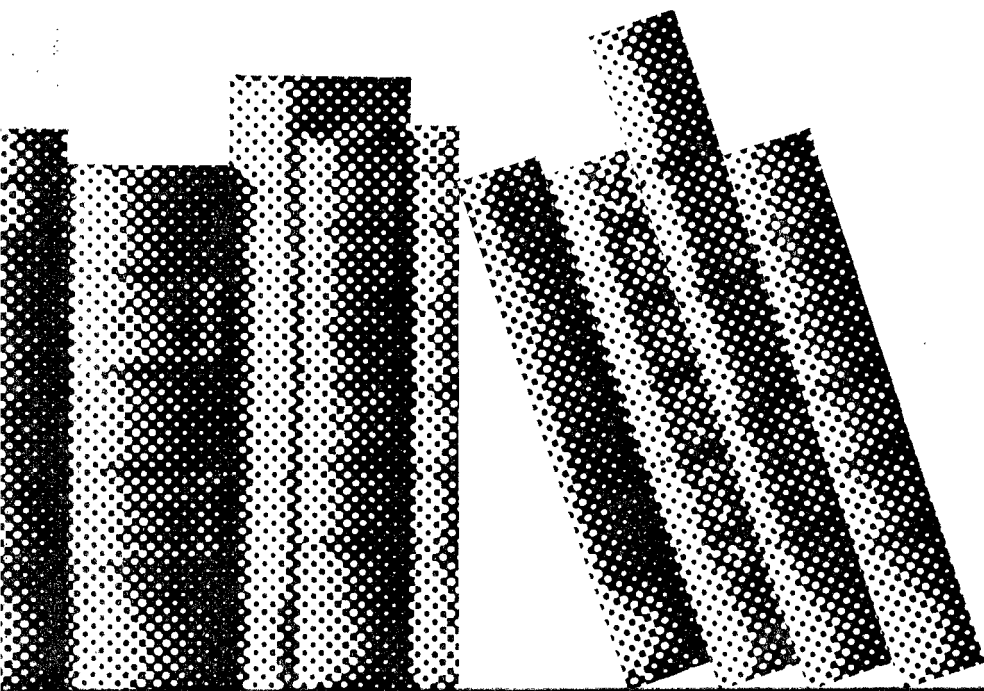# the universal decimal classification: present position and future developments

*by Barbara Kyle
and B. C. Vickery*

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THE UNIVERSAL DECIMAL CLASSIFICATION:
PRESENT POSITION
AND FUTURE DEVELOPMENTS

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UNESCO

THE UNIVERSAL DECIMAL CLASSIFICATION

A study of the present position and future developments,
with particular attention to those schedules
which deal with the humanities, arts and social sciences

by BARBARA KYLE,
Social Science Documentation, London

0. INTRODUCTION

0.1 *Use and importance of the UDC.* That the Universal Decimal Classification (UDC) is important is witnessed by the fact that a list of known users numbering between 4,000 and 5,000 has recently been prepared: furthermore, as the compiler writes: 'there are, of course, thousands more individuals and private users'. It seems unlikely that any other classification is more widely used, unless it is the Dewey Decimal Classification on which the UDC is based. How much material is classified by the UDC we cannot even guess but the quantity is so great and so rapidly growing that clearly it is of the first importance that the UDC should be able to carry worthily the responsibility thus placed upon it.

0.2 *Purpose of this paper.* The purpose of this preliminary study is to attempt to discover how far it succeeds at present and how far and by what methods it may continue to succeed or be made to succeed in the future. One person (or two, for Brian Vickery is tackling the problem from the point of view of scientific and technological users) with however many helpful consultants can only hope to isolate some of the problems and to indicate some of the possible solutions. This, it is hoped, may prepare the ground and stimulate the critical and creative efforts of others towards fruitful developments.

0.3 *Aim and attitude of author.* It may be useful to state at once that my personal view is ambivalent, stemming on the one side from a long-standing familiarity with the UDC such that, in tidying up my own papers and thoughts, I tend to think in UDC symbols; and on the other side from an intellectual conviction that the UDC needs such radical modifications as would make it almost unrecognizable, if it is to prove adequate to its task.

In spite of this conviction I have tried to work towards a constructive conclusion, feeling that a wholly negative suggestion to scrap the whole thing and start again would be unrealistic and unhelpful to a large number of committed users. Nevertheless, in working towards this conclusion I have not hesitated to make radical proposals.

I. ANALYSIS OF THE UDC CHARACTERISTICS
TO BE STUDIED

There are a number of explicit and implicit characteristics of the UDC which require consideration and each of which raises a number of connected problems. These in turn often have both intellectual and practical aspects.

1.1 *Character of the UDC.* The UDC is committed at present to dealing with the universality of knowledge,[1] to a decimal notation,[2] to a continuing close liaison with the Dewey Decimal Classification,[3] to international publication and use[4] and to the synthetic principle[5] of classification.

1.2 *Irreconcilables.* Each of these commitments alone creates its own problems which are severe enough, but in conjunction with each other they produce some that are perhaps insurmountable if the commitments are mutually irreconcilable and irrevocably fixed.

1.3 *Rules for revision.* To exacerbate the situation there are also a number of rules about development and revision which further encumber the path of the would-be reformer. These are again based on nearly irreconcilable aims. The whole position is stated clearly in the General Introduction to British Standard 1000A: 1957 from which the following paragraph is a quotation (p. 7).

'The governing rule in all UDC revision work is that the significance of a particular number may be extended or restricted, but may not be completely altered. If a UDC number (with any subdivisions) is obsolete, it may be "cancelled", which means that its use is no longer authorized because a better or more up-to-date arrangement has been developed under another number, often a "free" (unused) number. Eventually, the cancelled number becomes "free" (by disuse) and may then be authorized with a completely different significance, but only after a period of 10 years, which is considered the minimum necessary to enable current users to readjust their files and to avoid widespread confusion of the older and newer meanings. This policy undoubtedly slows down revision, but probably creates least dissatisfaction, especially when applied with discretion and some degree of flexibility.'

1.4 *Consideration of commitments and their implications.* I now propose to give some consideration to each of these commitments in turn; to try to discover what courses of action each would demand if fully observed and whether these courses are reconcilable, and then to consider how far they should be adhered to, modified or repudiated.

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1. 'it is a universal classification in that an attempt is made to include in it every field of knowledge'—British Standard 1000A:1957, p. 7.
2. 'it is . . . constructed on the principle of proceeding from the general to the more particular by the (arbitrary) division of the whole of human knowledge into ten main branches, each further subdivided decimally to the required degree'—ibid., p. 7.
3. See G. A. Lloyd. 'Comparison of the Dewey and UD Classifications', *Review of documentation*, vol. 27, no. 2, 1960.
4. 'as an international scheme UDC removes the occasional American emphasis found in the DC notation, e.g.' at 329 (Political parties). Division of any subject by place finds all countries equally provided for.'—British Standard 1000A:1957, p. 5.
5. Three fundamental features of the UDC may be directly traced to the early synthetic/mnemonic devices of the DC:
   (i) the common auxiliaries . . ., i.e. series of divisions recurrent throughout the whole field of knowledge;
   (ii) the special auxiliaries . . ., e.g. the linguistic divisions under each language;
   (iii) the linking together of main classes by means of the : (colon).'—ibid., p. 4.

2. UNIVERSALITY

The inclusion of every field of knowledge is the most important of the UDC's claims. What precisely do we expect if we are offered a universal encyclopaedia? Surely that it should mirror knowledge today and should be comprehensible to the users for whom it is intended, in language and arrangement.

2.1 *Complexity of modern knowledge.* In addition to its growth in size the universe of knowledge in recent years has grown vastly in complexity. Every new discovery sets off a chain reaction in neighbouring fields. The ability to send up artificial satellites has repercussions on television techniques, physiological studies and international politics, to mention only the obvious; the creation of electronic apparatus has stimulated the study of the brain and may revolutionize the storage and retrieval of information; splitting the atom has disturbed the balance of economic power in so far as it used to rest on stocks of coal and oil, and may upset the genetic future of the human race.

The classification of such interrelationships requires that the scheme of notation used be as accommodating and flexible as possible.

2.2 *Sociology of knowledge.* In addition to new relationships between subjects we have to add whole new philosophies of life. In the past cultures were to a great extent unconnected with each other. Peoples accepted the values of their own communities and were relatively unaware of other ways of life. With increase in communication, travel and translation it became less and less possible to live in these watertight compartments. Though these interrelationships have done something to 'universalize' knowledge, there are still areas of knowledge which, influenced by the ways of thought of a particular community, are recognizable as characteristic of those communities. But today, unlike yesterday, we know of the existence of these sociologically-coloured systems of thought; a universal classification must provide for them and accommodate their different semantics. Ideas from Eastern 'mores' must not be cramped by forcing them into Procrustean beds of Western making.

This may make necessary the provision of alternative schedules within a classification for overlapping but non-concentric circles of knowledge, and thus again requires a high degree of flexibility in the classification particularly in those schedules dealing with the arts, humanities and social sciences.

3. INTERNATIONAL USE

The requirement that the UDC should be not only universal in content but also of international applicability creates further intellectual problems of a similar nature. (Problems raised by the question of international administration I shall discuss again later in paragraph 7.)

3.1 *Lack of proportion.* For instance, looking briefly at the UDC (British Standard 1000A: 1957) abridged schedules for religion, we find 22/28 devoted to the Christian religion, while Buddhism and similar Hindu religions are provided for at 294, Islam and Mohammedanism at 297, and Confucianism, Taoism and Shintoism have to share 299. By any reckoning this seems a little out of proportion: only a radical re-allocation of notation could make any sense of the subject within the terms of reference 'universal knowledge for international use'.

3.2 *Verbal and linguistic.* Realization of the existence of problems of this magnitude make such difficulties as those of straight translation in the schedules and the index of the trilingual edition seem inconsiderable. But it must

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be remembered that the most powerful engine is useless if the mechanisms for starting it up and keeping it running are out of order.

The foreword to the trilingual (abridged) edition (British Standard 1000B: 1958) tries to dismiss in advance possible criticism at this level: it does not claim, we are told, 'to give exactly equivalent terms or to provide a multi-lingual glossary, but it tries to give, in three languages, a concise view of the subject fields covered by UDC'.

But unless both the schedules and the indexes are to be used, what purpose do they serve? And if they are to be used, the classifiers must be able to get the same answers irrespective of which of the three languages they use. Without this consistency the whole purpose of international use is thwarted.

3.3 *International subjects.* I have already pointed out in a review[1] of the tri-lingual (abridged) edition some of the weaknesses: for instance, in trying to classify such 'international' subjects as Unesco and the International Labour Organisation. By different routes we find Unesco placed under 001:341.16 and the reverse 341.16:001, and for the second in the English index we find 341.16:331 whereas in the French index if we search for Organisation Inter-nationale du Travail we shall, unless we are wary, use the number 331.91, which is for international associations of trade unions.

I have also suggested, and I repeat, that an international classification scheme should make a particular point of providing consistent placings for the multifarious international organizations of today.[2]

3.4 *International coverage and use differentiated.* Before leaving consideration of the international character of UDC, it may be well for the sake of clarity to make a distinction between two aspects of the problem—international use and international coverage.

International *coverage* is an essential element of universality: any classifier working on a single large general collection in a given country will need to classify foreign ways of thought, alien religious and political parties and philosophies. But these may, for his purpose, be subordinated and forced into a pattern which best serves his national assumptions.

International *use* demands that, as far as possible, equal weight be given to all national points of view and, where reconciliation is intellectually unac-ceptable, parallel schedules be provided.

Thus, it is in connexion with international use, rather than coverage, that the problems of consistent translation and indexing arise.

4. DECIMAL NOTATION

Now we turn to the commitment of the UDC to a decimal notation. We read in the general introduction[3] that this notation has the following useful characteristics: 'it is universally understood, and its members are commonly used in all parts of the world. Its members are infinite in number, and are arranged in order so that between any pair, an infinite number of new members can be intercalated without affecting the order of the original members of the series. . . . In practice, convenience dictates the restriction of the members to those possessing no more digits than can be readily assembled in the mind and transcribed on to paper.' (How many would this be?) There is little to quarrel with in the theory, but after so many years of practice it is worth taking a brief look at the result.

1. *Journal of documentation,* vol. 14, no. 4, Dec. 1958, p. 218.
2. For those readers who are interested in further examples and do not have access to the *Journal of documentation* I append the review. See Appendix A, p. 16.
3. British Standard 1000: vol. 1, part 1, 1943, p. 3.

With a notation tied to a short base of 10 digits, long numbers become inevitable, particularly in rapidly growing fields of knowledge such as technology (see the many 6-digit numbers in 62); in fields where no provision was foreseen (see 301.151 for the whole of social psychology); and when it becomes necessary, with international use in mind, to develop a recognized field more thoroughly (for instance, the Far Eastern religions already mentioned in 29).

I shall refer to these difficulties again when speaking of the liaison with the Dewey Classification and of the rules for revision.

5. LIAISON WITH DEWEY

All users of UDC know that it was originally based on Dewey. What is less clear is how far there are, and/or are to be, continuing connexions between the two schemes. G. A. Lloyd in a comparison of the schemes[1] at a three-figure level speaks in his introductory notes of 'serious divergencies of the interwar and postwar years' and the possibility of their being 'avoided or . . . minimized in future'; he even speaks, admittedly only as a hypothesis, of 'ultimate unification'.

It is not part of my task to criticize the Dewey Classification[2] but, without fear of contradiction, it is possible to say that it is in every way less well adapted for international use and for classifying complex subjects than is the UDC. If, therefore, unification is to be aimed at for international purposes the movement must be one of Dewey towards UDC, and not vice versa.

What is to be deplored and feared is any tendency for the UDC editors to keep an uneasy eye on Dewey thereby creating an additional obstacle in the path of revision and development. F. Donker Duyvis in his twenty-eighth report of FID/C, 'Universal Decimal Classification' 1958-59,[3] envisages changes which would go far to remove the objections referred to in paragraph 3.4 above, concerning the philosophy and religion schedules, but which would diverge still further from Dewey.

6. SYNTHETIC PRINCIPLE

The synthetic principle is one of the main reasons for the widespread use of UDC in preference to other systems. It extended the use of common tables, geographical subdivisions and viewpoints, all of which were established to different degrees in previous classifications, and added the 'colon principle' whereby every part of the classification became divisible by every other part. This, with the growing complexity of knowledge, was an invaluable invention.

If we now criticize the UDC, it is because its very success encouraged new thinking and opened up the possibility of systematizing some of the haphazard usage of its invention. For one reason or another, the UDC has not been able to keep up with these developments. There is therefore a growing body of opinion which supports the view that for new libraries and bibliographical information services it might be quicker, more efficient and more economical to start again rather than wait for a revised UDC.

6.1 *Patchwork improvements.* For instance, in the humanities and social sciences there is constant need to classify activities according to the various categories of human beings performing them or being acted upon. The germ of this

1. *Review of documentation*, vol. 27, no. 2, 1960, p. 45.
2. See E. J. Coates. 'The Decimal Classification, edition 16: class 300', *Library Association record*, vol. 62, no. 3, March 1960, p. 84-90; and 'The Dewey Decimal Classification: edition 16', *Library Association record*, vol. 61 no. 8, August 1959, p. 187-90.
3. *Review of documentation*, vol. 26, no. 4, 1959, p. 121.

idea is found in a special analytical subdivision at 3-05. But this table is insufficiently developed and insufficiently applied, so that the numbers for children, the aged, women, the handicapped, foreigners, lunatics (to name but a few examples) in different contexts (see Table I) have no consistency or mnemonic character.

It is this sort of patchwork attempt to tidy up small sections of UDC which is making it year by year more confused and which is threatening its whole structure.[1]

TABLE I

	Children	Aged	Women	Handicapped	Foreigners	Lunatics
Care of	362.7	362.6		362.4	362.92	362.2
Education	372.2			371.91	374.95	
Employ	331.3		331.4	331.59	331.62	
Homes for		725.56				725.52
Votes			342.83			
Special table persons 3-05	3-053.2	053.9	055.2	056	—	—

6.2   *Not synthetic enough.* Finally, is the UDC sufficiently synthetic? Many of the criticisms[2] levelled at the UDC at the intellectual level are concerned with its hierarchical structure in the main classes. Common subdivisions, special analytical divisions and the use of the colon are not enough to make clear the interrelationships in modern knowledge. Further common subdivision and further special analytical divisions for more schedules might help, but probably would not go far enough.[3]

7.   ADMINISTRATION

In its administration lie both some of the greatest strengths and weaknesses of the UDC.

At the time of its origin and early development it combined advantages which no one existing classification could offer.

7.1   *Wide use.* For this reason, and because a permanent secretariat no less stable than that which was responsible for Dewey gave promise of continuous and controlled development, the UDC won wide acceptance.

In considering the future of the UDC and particularly the question whether, in spite of all the criticisms that may be levelled at it, it should in future be supported by national and international funds, the number of its users must be an important factor.

There are at present some 5,000 officially known users of the UDC: of these very many have a strong incentive to continue using it because of the heavy and expensive work involved in reclassifying their collections should they decide to change to another system.

The UDC, as a result of its centralized administration, its international

1. Further examples are shown in Appendix B, p. 18.
2. Eric de Grolier. 'Tendances actuelles en matière de classifications et codifications documentaires', seventh report to committee FID/CA, Co-rapporteur, p. 1-4; and 'Étude sur les catégories générales applicables aux classifications et codifications documentaires', Unesco for the International Advisory Committee for Documentation and Terminology in Pure and Applied Science, August 1959, p. 14 et seq.
3. For a clear statement of the detailed working of the UDC, see E. Jacquemin, 'La classification décimale universelle: description et commentaire des règles en usage', *Review of documentation*, vol. 26, no. 4, 1959, p. 101-14.

contacts and its early success in dealing with compound subjects, has an impressive number of adherents. How far does the administration today satisfy them?

7.2 *Users' views.* I invited comments from a number of users in the field of the social sciences, asking them particularly to point out advantages and disadvantages in using the UDC.

Among the advantages listed, two are connected with administration—easy availability of the schedules and the fact that many other libraries use the scheme. This last 'universality of use' factor was mentioned more often than any one other factor.

What might be thought to be the principle disadvantage—the slowness of revision—was seldom mentioned but, in the light of the frequent comments about 'making our own revisions', it would seem that some users do not wait for the revisions. No evidence is available as to what happens as a result of this impatience.

The difficulty which faces the controllers of the UDC is clearly shown by the fact that existing users complain also about 'frequent changes'.

Here is an irreconcilable dilemma. Those who want changes in their own subject field want them quickly, but equally do not want any changes in subjects which are not their principal interest.

7.3 *Varying types of users.* In trying to break this vicious circle it may be worth trying to judge whether there are stronger reasons in certain subject fields than in others for the retention or abandonment of the UDC by existing users; whether it is advisable for librarians, bibliographers or documentalists who are about to initiate new information retrieval systems or services to adopt the UDC and whether the subject field of these services affects the answer.

Further, one might ask does the type of information service or library also affect decisions to use or not to use the UDC: for example, does the large library primarily interested in books find the UDC more or less satisfactory than does a highly specialized system analysing information into small units?

8. DIFFERENT FIELDS AND TYPES OF USER

I shall omit from these considerations two large categories. First, those very large collections already (almost certainly irrevocably) using the UDC and, secondly, those working in the fields of science and technology whose point of view is the subject of Brian Vickery's study.

8.1 *Universal.* As for the other subject fields, let us consider them severally. Libraries and documentation centres covering the whole field of knowledge may be well advised to continue to use the UDC. There are fewer alternatives available than there are for specialized services; and the amount of very detailed information is less than in highly specialized collections. Of the existing universal systems, the UDC is probably the most widely understood (an advantage is that UDC and Dewey users can soon learn to understand each other's systems at present), and it provides the most elastic notation for new subjects at the level of general interest.

8.2 *Philosophy and religion.* I have already mentioned some of the disadvantages here in paragraphs 2.2 and 3.1 above. Libraries specializing in these subjects in a world-wide context would find the notation very disproportionately distributed, a strong Western bias, and little provision for subjects bordering on logic, such as information theory, cybernetics and modern

studies of mind and brain. Much of this is well known by the controllers of the UDC and has been discussed by Donker Duyvis in the report already mentioned.[1]

8.3 *Social.* For libraries in the field of the social sciences the UDC is very unsatisfactory. In this it is not alone: this field of knowledge presents peculiar problems for any classification aiming at universality and international use. The objects of study are ill-defined, rapidly changing and highly complex. Furthermore the subjects or disciplines are highly coloured by national ways of thought. I have tried in a previous paper to assess the various existing classifications from the social scientist's point of view.[2] The conclusion was that all were unsatisfactory but that, of those universal schemes likely to be considered in the West, the UDC was probably the best from the point of view of elasticity of notation and continuing possibilities of reform, and Bliss the best from the standpoint of up-to-date knowledge of the social sciences.

Nevertheless, so drastic are the changes needed in the UDC if social science material is to be adequately dealt with that I shall concentrate almost wholly on this field when considering actual proposals for reforming the schedules.

8.4 *Language.* Language and linguistics hovers between science and the humanities. It is well classified by its own subject specialists and for that reason many documentalists in the field may not be greatly interested in universal schemes of classification. They may however be interested in international use and for this reason might very well adopt the UDC.

8.5 *The arts and literature.* The arts, including literature, present few problems to the classification maker. Here we are primarily interested in time, place and individual creators by name. These are all unambiguous concepts. In addition provision must be made for certain common divisions for materials used, applications, styles and forms. The UDC makes such provision, and without great difficulty this could be further developed and made more consistent for the different arts. The elasticity of the UDC notation is also an advantage for the arts because in different circumstances, where desirable, the collections could be arranged first either by place or by period.

8.6 *Geography and travel, and history.* The same divisions of time and place are relevant to a great extent for classifying geographical, topographical and historical material, and here the UDC is satisfactory. Also, by the use of the colon, it makes it possible to bring together in class 9 particular subjects which many classifiers prefer to have classified with history, thus escaping the criticisms levelled at Dewey for separating so much social, economic, constitutional and political history in class 3.[3] So much for subject fields at a fairly generalized level.

8.7 *Specialized services.* When we come to documentation services dealing with highly specialized subjects, the need to be able to classify highly complex information and to be able to keep up to date in our coding of new knowledge becomes increasingly important. It is here that the slow and clumsy machinery for revision and the obstacles caused by adherence to Dewey, and also the difficulties of international intellectual co-operation become so frustrating.

1. See page 57, footnote 3.
2. Barbara Kyle. 'Merits and demerits of various classification schemes for the social sciences', *Unesco bulletin for libraries*, vol. XIV, no. 2, March-April 1960, p. 54-60.
3. See E. J. Coates, 'The Decimal Classification, edition 16: class 300', *Library Association record*, vol. 62, no. 3, March 1960, p. 84-90.

8.8 *Obstacles to progress.* The 10-year rule together with the short base of the notation are alone enough to prevent the UDC from adequately serving any specialist working in a developing field of knowledge. It is not known how far these obstacles are preserved because the co-ordinating committee consists of publishers of nationally published schedules with vested interests against change. However, if the International Federation for Documentation (FID) is determined to preserve and develop the UDC, it will need to use quite as much energy in removing stumbling blocks as in constructive effort.

9. RECOMMENDATIONS

I have made some attempt to expose the imperfections of the UDC, to give the reasons for them, and to identify some of the obstacles that stand in the way of improvements.

It is also necessary to suggest what ought to be done and how. In the context of all the difficulties these recommendations may appear unrealistic, will probably be unpopular, will certainly be controversial, and are definitely not put forward as final, comprehensive or incapable of further improvement.

9.1 *No commitment to Dewey.* As we have seen the administrative machinery of the UDC is itself too slow, for reasons which may sometimes be good and sometimes less good. Further impediment in the way of administrative and/or intellectual improvement would be crippling. If, therefore, liaison with Dewey might create or maintain such impediment, I think the disadvantages would far outweigh the advantages. It is imperative that the UDC controllers be absolutely free from outside considerations and liaison with Dewey must be limited to exchanges of information, if anything closer would act as a brake on development.

9.2 *Notation: Arabic numerals.* How far do the advantages of using Arabic numerals outweigh the disadvantages of a short base, a growing lack of proportion in the notation of different schedules and the near-impossibility of providing for new subjects and a more satisfactory order under the present rules for revision? In the General Introduction to British Standard 1000A:1957 (p. 7) we read that the decimal 'principle can be applied to any notation'.

9.21 *Use of the alphabet for better proportion.* For the purpose of exploring possibilities let us imagine some of the implications of gradually moving from Arabic numerals to letters of the alphabet.[1]

First we might allocate the symbols roughly in proportion to pages required for each main class in the abridged UDC (British Standard 1000A:1957) thus:

TABLE 2

Present class nos.	Alphabetic symbols	Pages allocated	Present class nos.	Alphabetic symbols	Pages allocated
0	A	3		M R	
1	B	3—	6	N S U	53+
2	C	3+		P T	
3	D E	22—	7	V X	8
4 (see 8)	F G		8 and 4	Y	3
5	H L	20	9	Z	2

1. I have omitted some of the more internationally objectionable letters. If the principle were accepted an agreed alphabet could no doubt be worked out.

9.22 *For improved order.* Within a main class to which more than one letter is allocated an improved order could be given. For instance, in class 3, now D, E and F, we might have demographic questions, including all types of human persons and immigration, and basic human relationships in society gathered together at D, with breakdowns in society, their causes and cures; this would bring together after demography the studies of the social psychologist, the sociologist and the criminologist. E could then be used for politics, administration and constitutional questions now in 32, 34 and 35. At F we could combine economics from 33 and commerce from 38.

If all revisions and developments were published in the new notation the old numbers would be cancelled and in 10 years wither away.

9.23 *Existing users.* Existing users would either use these revisions and thus gradually move with the classification towards new schedules, or continue to make their own revisions, with or without the help of the official revisions.

In this way although the 10-year rule would apply to the old notation it would not hold up improvements which depend on the possibility of accommodation in the relevant places in the classification.

9.24 *Ten-year rule.* I am unable to see how any but minor modifications can be achieved under the 10-year rule.

If, as is indeed the case, we think that 30 Sociology is quite inadequate (with its 6-digit number for the whole of social psychology) and we cancel it, having prepared better provision for the subject, what do all users do for 10 years?

9.25 *Changed notation for revisions.* I therefore propose that serious consideration be given to the possibility of speeding up revisions and of making more radical developments in the UDC by instituting a new notation for the purpose on some such lines as those suggested above.

9.3 *Alternative to 9.25.* If this suggestion is for any reason impossible, there is a possible alternative for those schedules that need the most drastic revision. If the schedules for science and technology are considered satisfactory or likely to prove so as developed under the existing rules, and if the schedules for the arts, literature and history require only minor changes, the schedules which require radical reform are those for philosophy, religion and the social sciences. The number of users of these schedules is very much smaller than those using classes 5 and 6; and this number is not likely to grow until the schedules are much improved.

It might be worthwhile to circulate a questionnaire among those existing users (including of course, those using all the schedules) asking them to agree to a complete re-drafting of classes 1, 2 and 3 within the next five years.

Another possibility, if we start with the social sciences, might be to move language and linguistics to class 8 and to redevelop schedules for the social sciences at class 4.

9.4 *International difficulties.* In addition to the difficulties of the 10-year rule and the already overburdened and disproportionate notation there are a number of administrative difficulties. The first of these is the basic one of getting anything done by widely scattered and insufficiently co-ordinated and supervised workers. I have myself suffered from the frustration of getting no response (not even a negative or critical veto) to suggested modifications presented in response to the requests of the official machine. After two years of silence interest is inclined to diminish. Nevertheless I believe this inertia is connected with the difficulties previously mentioned. For, as I have pointed

out, however good the modifications offered by the various committees and individuals may be, the delays in making them effective are so great that the modifications are already out of date when accepted for use.

9.41 *National schedules in parallel.* Some of the problems are, however, of another kind and have to do with the difficulties of getting international agreement. It might be better to plan that schedules for the less controversial subjects be subject to international agreement, while providing for the possibility of parallel schedules for subjects where national variations make this desirable. Similarly it might be possible to get international agreement for the more general level with provision for detailed expansion in parallel for the different national editions. Notational modifications could make clear all places in the schedules where these devices were to be operated.

9.5 *Administrative machine.* I have referred throughout in general terms to clumsy and slow administrative machinery. It is perhaps necessary to say something in detail about how this machinery works before making proposals to better it.

The UDC is controlled by FID through a number of committees. These are[1] FID/C 'UDC' which is 'the highest authority in the development of the UDC'; FID/CCC which consists of editors of full editions of the UDC with ability to co-opt but with no stated terms of reference or powers; FID/CN which deals with notation principles; and a number of panels for particular sections, each with one or more rapporteurs.

Suggestions for developments, alterations and revisions may come from anywhere but should most often emanate from the panels, the membership of which changes frequently and which meet seldom and irregularly. Their work is stimulated or activated by the enthusiasm of the rapporteurs who, with the members of FID/CCC and the national members (who may be represented by people not expert in the use of the UDC), form the supreme authority, FID/C 'UDC'. Proposals for change, having passed through (or evaded) all these channels, are circulated as PE Notes to all subscribers and, if no criticism is received within four months, are accepted.

9.51 *Criticisms.* The weaknesses of such machinery for getting anything done, still less for accomplishing integrated intellectual work of a high level, are obvious and have often been attacked. These attacks have, indeed, very often been issued from within the FID secretariat and membership.[2] But these attacks, accompanied often by constructive proposals, have not so far led to a great deal of action, nor to decisions on whether or not proposals should be accepted in principle. For instance in the 1955 document[3] I find the suggestion that 'the present rule of a 10-year vacancy should be abolished' together with a statement that 'Radar has been moved to and fro several times during the last 10 years', but I can find no later ruling as to whether the 10-year rule is or is not to be kept. The remark already quoted from the General Introduction that this policy is probably satisfactory 'when applied with discretion and some flexibility' merely underlines the uncertainty.

9.52 *Revision of machinery.* It is recommended that the rules for revision be carefully studied and be then revised in the light of all the foregoing criticisms, so that where necessary different rules would be applicable to different schedules, and in some cases national schedules in parallel would be made

1. I quote from *FID yearbook, 1958—supplement 1960.*
2. N. A. J. Voorhoeve. *Remarks on the organization, the development and the publication of the UDC.* FID F (Comm) 60-96, 23 August 1960.
3. Arne Sundelin. *The present system of revision of the UDC: some critical remarks.* FID F 55-60, 22 July 1955.

possible. Furthermore the two overall committees FID/C and FID/CCC be reconstituted as one committee with supreme authority, and a sub-committee set up whose sole purpose would be to ensure that no piecemeal revisions were accepted if they conflicted with the overall design.

9.6 *Conclusions.* The conclusions of this study are, first, that the UDC cannot be recommended to new users who require detailed and up-to-date classification in the whole universe of knowledge or in the fields of philosophy, religion and the social sciences[1] unless there are radical revisions, intellectual and administrative; and second, that national and international funds might be better employed in supporting efforts to create a fully synthetic classification for the future than in preserving the present machinery of the UDC; and finally that, if the UDC is to continue to receive substantial (and probably increased) financial support, this should be contingent upon full discussion of the criticisms summarized in this study, followed by a public statement of detailed and viable plans for the future to meet these criticisms if they are found to be valid.

For the purpose of drawing up such a programme it would probably be worthwhile to organize a small international conference (such as was held at Dorking under the aegis of FID/CA in 1958) whose terms of reference would be to study in advance criticisms and proposals for reform, and to draft final recommendations to the FID.

APPENDIX A[2]

BRITISH STANDARDS INSTITUTION. *Universal decimal classification.* B.S. 1000B: 1958 (FID no. 277). Trilingual (abridged) edition. London, British Standards Institution, 1958, 515 p.

I have already reviewed B. S. 1000A, the English abridged UDC, and I shall not therefore repeat here my previous criticisms. What is of most interest on this occasion is that this is a three-language version, which raises questions of terminology, indexing and translation.

The problems to be faced were prodigious, and it is not easy to know where to start in trying to assess the degree of success achieved in coping with them. Criticism is to some extent disarmed by the foreword, where we read '(this) edition does not claim to give exactly equivalent terms or to provide a multilingual glossary, but it tries to give, in three languages, a concise view of the subject fields covered by UDC'. But immediately one feels moved to ask 'Is this a proper limitation?' Surely one of the main purposes of the UDC was to provide an international language for the library and documentation profession. Perhaps the fairest test is to find out

whether the same class-mark is arrived at for a concept irrespective of the language used.

I started quite arbitrarily looking for Unesco, which happens to be classed at the very beginning of the classification at 001:341.16. In the English index this is given under 'Unesco' as 001:341.12, so that by chance I may have stumbled on the only misprint. 'Unesco' is given in the German index correctly as 001:341.16, but so far I have failed to find either 'Unesco' (which is how the name is given in the French column of the schedules) or 'Organisation des Nations Unies pour l'Education, la Science et la Culture' in the French index. The French user of the classification may discover, by searching for 'Organisation des Nations Unies' and its specialized agencies, Unesco at 341.16:001, while his confrère in the same library finds (on page 55) 001:341.16. This is a drawback in the use of the UDC whenever a colon-number is used. There is no guidance as to which of the possible number combinations is to be used in a catalogue or index when only one entry can be afforded.

Following my search for Unesco I tried

1. Again I leave Brian Vickery to speak for sciences and technology.

to find correct placings for other international bodies, with the following results:

Unesco 001:341.16 341.16:001

UNRRA 362(100) (universal or international social welfare)

ISO 389.6(100)

ILO 341.16:331 (by English index). In the French schedule appears 'Organisation Internationale du Travail', but in the French index one finds Organisation Internationale du travail 331.91 which is the number for ' organisation et contrôle international du travail'.

It is not very clear to me when a number for an international organization is made by subdividing 341.12 by colon to the subject, and when the subject with (100) is to be preferred; furthermore in this world of international organizations I think a great effort should be made to get these listed in a standardized form in all three indexes. At present we find in the English index CARE, ILO, ISO, UN, UNRRA, YMCA, YWCA, listed by initials at the beginning of each letter of the alphabet; OEEC listed by initials but alphabetized as though a word; ICAO nowhere. FAO is not in the English index of the trilingual edition though it is in the English version B.S. 1000A, where its number is given as 341.16:63. As far as I am able to see there is no place in the index for the FID.

Proceeding a little further into the volume I found under 'Bibliographies' at 019.9 a curious addition to the English translation. The French version gives 'Bibliographies et catalogues classés d'après des caractéristiques diverses', the German 'Sonstige, nach eigenen Merkmalen der Bücher geordnete Bibliographien und Kataloge', but the English after 'Special bibliographies and catalogues' adds 'of a book review character'. Why?

This led me to look for book reviews, which are classed with abstracts in Table d, 'Common auxiliaries of form', at (048.1). I was able to find 'abstracts' in the English index, in the French 'compte rendu', and in the German 'Referat' and 'Besprechungen', but nowhere 'book reviews'.

I then looked for my test concept for classifications—cybernetics—and here the system did really break down. In the French index I found 621.391, in the English index see 'Automatic control', where the numbers given are 621-52/-55, 621.3.078 and 621.316.7, but no mention of 621.391, though in the English schedules the words in the heading at 621.391 are 'General questions, Cybernetics, i.e. information and communication theory in relation to telecommunication'; nor is there any mention in the English index of 'information theory' or 'communication theory'.

To take a better-established subject than cybernetics, I searched for historiography or the science of history. In the French index I find 'Histoire, comme science' 930.1; in the English index I find neither 'historiography' nor 'history as a science', though in the English schedules 930.1 is given to 'History as a science'. 'General world history', as I indicated in my review of B.S. 1000A, is also somewhat confusing: how does one distinguish between 93/99 'History', and 930.8 'Descriptive universal historical studies', which presumably could also be symbolized by 93/99 (100)?

In a trilingual index it would be helpful if some clear guidance could be given as to the use of the words 'knowledge' and 'science', 'science' [French], 'connaissance', 'savoir' and 'érudition', and 'Wissenschaft' and 'Kenntnisse'. Similarly, greater clarity is needed on the exact meaning of 'general', 'international' and 'world-wide'.

A final point about the indexes: it is not perfectly clear whether all three are intended to be abridged indexes to the abridged classification schedules. For instance, in the French and German indexes 'international police force' is given as 341.4, whereas in the English index the number is 341.45—a number which does not appear in the schedules.

As a result of these preliminary searches I feel no great confidence in this edition of the UDC, particularly as these are in fact the only concepts I checked and not a selection of bad examples from a greater number. It is, of course, true that I am testing the UDC from the point of view of social science and the humanities, and that the natural sciences and technology schedules are much more highly developed.

BRITISH STANDARDS INSTITUTION. *Universal Decimal Classification.* B.S. 1000A: 1957 (FID no. 289). Abridged English edition. 2nd edition, revised 1957. London, British Standards Institution, 1957. 252 p. 41s.

The difficulties to be overcome in editing a new edition of a widely used classification scheme are prodigious, and before criticizing B.S. 1000A: 1957 it is only fair to indicate the extent of the problem. There are several strands in the rope that strangles the development of the Universal Decimal Classification and ties the hands of would-be users. The first is the complexity and inter-connectedness of modern knowledge, which has stretched even the elasticity of the UDC to breaking point in many places; another is the justifiable unwillingness of established users, with large collections of material, frequently to alter numbers in use; with this is connected the UDC's own rules for revision,[2] which are perhaps too rigid, conservative of the interests of existing customers at the expense of any radical attempt to keep pace with progress in knowledge; and finally the great difficulty of seeing the whole tree for the branches. Specialists can be and are brought in as advisers in certain fields, but who is responsible for the overall view?

It is to this last consideration that I want particularly to draw attention, and for two reasons. For one thing I am not a competent judge of the scientific and technical classes where the greatest revisions have been made and I therefore leave detailed study of such schedules to specialists in the field; I also believe that it is possible to illustrate how much farther the UDC might have been developed towards satisfying modern requirements, while at the same time retaining the goodwill of present users, in its general plan as illustrated by the Prolegomena and Generalities class, some of the tables and the divisions introduced by 0. At this date no-one interested in classification (and this must include the drafters, editors, and purveyors of the UDC) can be unaware of the tendency to search for categories common to many fields, of the need to express new complex subjects and for a notation combining as far as possible brevity with mnemonic and synthetic qualities. This being so one is entitled to expect a revised edition of a scheme of classification to be improved in these directions. To show the sort of improvement I am advocating I have first attempted to indicate some of the confusions I deplore and which might without great difficulty have been tidied up. For instance, criticism of art is 7.072, of literature 8.09. Knowledge itself and its fields and methods are somewhat enigmatically dealt with:

Generalities, science, knowledge   0
Fundamentals of knowledge and culture   00
The sciences and knowledge in general   001
Activity and organization in general, human work   007
Civilization, culture, progress   008
Humanities, arts in general   009
Exact sciences in general   501 (why not use 005)
History of knowledge, from mythology to science   165.9

Coming to theory and method we find:

General methodology of knowledge in general   001.8
Logic, theory of knowledge   16
Epistemology, theory of knowledge   165
Sources and types of knowledge   165.1
Scientific inquiry   167
Scientific systematization   168
Scientific research   5.001
Organization of science and of scientific work in general   001.89
Method of study in history   930.2
Theory, research   .001 (table (i))

Reverting to:

Civilisation, culture, progress   008

we also find

History of civilization   930.85

and for general world history we have also:

Descriptive universal historical studies   930.8
General history, world history   930.9

Further study of the schedules and comparison of the numbers at 00, 7.0, 8.0, 930.1/.9 and 16 with such numbers as 78.0/78.092 and 930.22 and tables (d) and (i) will produce more evidence of this confusion (see Table 3).

What might have been done? First, class 0 Generalities might have been reserved for Prolegomena (now 00), that

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is knowledge and its fields more broadly conceived than in the main classes; such numbers as my suggested 005 Exact sciences in general might carry a note to the effect 'may be preferred at 501'. Second, much of the rest of the Generalities class might have been combined with table (d), which could then quite easily be used as an anterior class to 0 for collections arranged by form rather than subject. (02 Librarianship could be accommodated at 002.) Third, table (i) might have been similarly enlarged to take care of such concepts as criticism, scientific method (166/168). Fourth, all 0 divisions of classes could then be subdivided by tables (d) and (i) to prevent the sort of confusions indicated above.

To turn from the general picture to a main class to which it is claimed, by implication in the Foreword,[1] greater justice has been done than in the 1948 edition, namely, class 3 Social sciences is to ask how could less justice be done? True, the long-accepted academic disciplines of economics, political science, and law, together with their applications in social welfare, administration, and penology, are reasonably well represented though somewhat quaintly arranged. But any recognition of the existence of scientific study of the whole field of human behaviour (the behavioural sciences as they are sensibly called in the U.S.A.) is absent: the whole field of social psychology is accommodated at 301.151 with no subdivisions; and although literary warrant shows that methodology is a current object of study constantly appearing in the literature of the social sciences practically no provision is made for its classification.

Finally, a word about the index, which has been enlarged tenfold since the 1948 edition. Some of this enlargement comes from including subjects not in fact appearing in the schedules and this seems to me an improper practice, particularly

when coupled with the advice: 'Never rely on the printed index alone: always verify in the systematic tables.'[2] A note at the head of the index states: 'Detailed subheads, when not given in the abridged tables, are implicit from the context.'[3] I cannot agree. It is difficult to check whether 398.46 Dwarfs and 398.43 Elves are correctly derived when in the tables only 398.42/.43 is given for Ghosts, spirits (gnomes, fairies, elves). .46, the number for Dwarfs and giants, comes outside .42/.43. .44 I discover (by reference to the French edition, 1952) is Dragons and .45 is still vacant. Equally hard to check with the tables are the following: Oblique ... (124), Vertical ... (122), Horizontal ... (125), and Humiliation, sociology 301.172.2, which is derived from 301.172 Differentiating: individualism; leadership. The last-quoted fascinating number immediately calls to mind 'humility', surely a more usual concept, for which no entry is provided. Nevertheless, it is certainly true that great improvements have been made, and the temptation to quote further examples of this sort must be withstood.

Indeed, it is sad to have to be so critical of the UDC today. It is a classification which, for its initial dash and verve in providing a synthetic notation, attracted a great deal of support and loyalty: this very loyalty has hardened now into vested interest and, unless a more elastic policy for future development is adopted, will preclude use of the UDC by forward-looking documentalists and librarians.

Incidentally on page 3 of the Foreword (to the 2nd edition) is the statement: 'The tables correspond closely to the English text of the new three-language abridgement (German-English-French), which ranks henceforth as the international standard abridged edition of the UDC.' No bibliographical details are given and at the time of writing this review (14 June) I believe this edition to be still unpublished.

1. p. 3.
2. p. 8.
3. p. 145.

THE UNIVERSAL DECIMAL CLASSIFICATION AND TECHNICAL INFORMATION INDEXING

by B. C. VICKERY,
Department of Scientific and Industrial Research,
Lending Library Unit, London

The literature of documentation contains many criticisms of the defects of general classifications such as the Universal Decimal Classification (UDC) and many documentalists have preferred to compile and use special classifications or subject codes. Yet the UDC continues in use and development, other general classifications are constructed (Bliss, Ranganathan) and calls for new schemes are still heard. Despite the defects of a general scheme, it must have solid advantages.

Who uses a general classification? It is clear that the more comprehensive libraries and bibliographies will need a scheme of wide scope. On the other hand, specialist bibliographies intensively covering a restricted and well defined field of knowledge may find the remainder of a general scheme irrelevant. The same might appear to be true of specialist libraries serving particular social groups, but it is generally found that the literature needs of such groups are not confined to a single field of knowledge: the subjects indexed by a special library usually range over many disciplines, many of the 'main classes' into which a general classification is traditionally divided. For raw material, at any rate, a special library classification needs to draw on a general scheme.

This study of the UDC sets out from the assumption that both general and special documentation services can make use of a general classification. On the other hand, it assumes that the criticisms of the UDC—and the preference of some documentalists for alternative special schemes—imply that the UDC does not adequately provide the facilities currently needed. In examining these criticisms and some special schemes an effort is made here to elucidate those features of the UDC which prevent it from being more widely used and then to suggest how the UDC might be developed to provide the facilities needed.

CRITICISMS OF THE UDC

As a part of this survey a number of special librarians using the UDC for science and technology were invited to make comments on the scheme. Its users praise its universality, its flexibility, 'the relation signs which allow unlimited definition'. General criticisms are made of slowness in revision (often ascribed to lack of funds), and inadequate indexes, and some find its notation over-elaborate and confusing. Slow revision leads to inadequacy in newly developing subjects, such as Plasma physics, the Solid state, Guided missiles, Astronautics.

The most widespread criticism is of the separation of pure and applied science. The differentiation of 54 and 66 is criticized, although some consider it workable. There is no analogous section for Technical physics. 'Thus 536.48 and 621.561.57 overlap and involve very arbitrary decisions at times.' 'In 533 and 626/7 there is a large amount of repetition.' The separation of 57/59 from 63 creates difficulties.

Such explicit criticisms, though indicating some of the facilities needed by

users, do not in themselves give more than general guidance as to the direction in which the UDC should be developed. An implicit and more detailed criticism is provided by a study of special schemes which have been constructed as preferred alternatives to the UDC for information indexing. It has been possible to make such studies for only a few fields of knowledge, but the examples referred to below do offer some clues to the problem.

COMPARISONS WITH SPECIAL CLASSIFICATIONS

The first advantage of a special classification is that it often incorporates much more specific detail of a subject than does the UDC—and this is often advanced as the main reason why a special scheme is adopted.

A second feature in which special classifications go beyond the UDC is in providing for the flexible combination of terms to represent specific compound subjects. It is true that the principle of combination (co-ordination, synthesis) has been a feature of the UDC since its inception and that compound class numbers can readily be formed by the use of auxiliary tables, analytical subdivisions, the colon and intercalation. Nevertheless, recent special classifications have tried still further to aid synthesis by the conscious and explicit allocation of terms to homogeneous facets.

A first illustration of this is from the English Electric (EE) classification system.[1] The primary categories in the scheme are:

A	Industries and professions
B/E	Plant and machines
F/K	Components
L/N	Materials
O/T	Physical phenomena
U/Y	Operations
Z	Agent (instruments and equipment)
1/9	Language, form and geographical divisions
a/z	Auxiliary schedules (Industrial applications and Common attributes).

Throughout the schedules, there are 'sub-facets' which may be combined to give more precise subject description. Some examples of this are given below. In each case the sub-facets are named, the English Electric notation is given and, in addition, the UDC class number which approximately contains the sub-facet (though it may be less detailed than the EE schedule).

Example	*Sub-facet*	*EE*	*UDC*
(a) DC motors	Mode of winding	Bbb to Bbf	621.3.04
(Bb, 621.313.2)	Enclosure and cooling	Bbr to Bbst	621-71
	Mode of proofing	Bbv	621-784
	Application	Bba, Bb-	colon
(b) Steam turbines	Temperature, pressure	aj	621-186
(Db, 621.165)	Arrangement	ar	(1)
	Cycle	Dbb to Dbl	621-16
	Application	Dba, Db-	colon
(c) Diesel engines	Cycle	De to Dec	621-14
(De, 621.436)	Piston arrangement	Ded	(1)
	Cylinder arrangement	Deg to Deh	?
	Charging system	Dem to Deq	?
	Fuel	Des to Det	621-6
	Cooling system	Dew	621-71
	Application	Deq, De-	colon
	Mechanical parts	J	621-2/-3

1 Forthcoming article by Miss Jean Binns.

(d) Boilers	Temperature, pressure	aj	621-186
(Dz, 621.18)	Regenerative system	aj	621-186
	Mode of construction	Dzg to Dzs	621.18
	Mode of firing	Dzv	621-6
	Feed water components	F	?
(e) Modulators	Mode of modulation	Gcj to Gcl	621.376
(Gc, 621.396.619.2)	Components	Gcs	621.3.032
(f) Coatings	Mode of application	Ld	(667.66)
(paints. etc.)	Composition	b to d	667.633.2
(Ld, 667.6)	Purpose	h to n	667.638
	Pigment	r	667.633.4
	Vehicle	s	667.621
	Mode of hardening	t	?
	Solvent	v	667.629.2
	Finish	y	667.629.8

Most of the sub-facets available in the English Electric scheme are also available in UDC, although I have failed to locate a few (the queried items in Diesel engines, Boilers and Coatings). In general, however, the sub-facets relevant to a particular term are rather more scattered in the UDC: for DC motors, 621.313.2, one must turn to the 621.3.0 and 621-7 subdivisions; for Steam turbines one must use the (1) auxiliaries.

A third characteristic feature of special schemes such as the English Electric is that they express specific subjects with far more economical notation. (In the following examples, the letter 'd' in UDC numbers means 'a subdivision of the preceding number, not given in the Abridged English Edition'.)

(a) DC motors, series-wound, direct-cooled, submersible:
EE=Bbcstvf
UDC=621.313.2.04d-71d-784d
(b) Diesel engines, 2-stroke, dual fuel, air-cooled—crankshafts for:
EE=Decswm Jbt
UDC=621.436-14d-6d-71d-232d
(c) Paints, sprayed, oil-based, external, glossy:
EE=Lewbhyg
UDC=667.633.24:667.666:667.638.d:667.629.8d

In subjects (a) and (b), the sub-facets are UDC analytical divisions and the extra length of notation is due partly to its base (numerals instead of letters) and partly to the 'common facet' nature of these divisions (a point which will be taken up again below). Subject (c) is an example of a UDC class where no specific sub-facets are provided as analytical divisions, so that they can only be expressed by main class numbers. The number 667.666 does not properly express 'sprayed', but 'spraying' (whereas the w in the EE number does mean 'sprayed': the subject 'spraying of glossy, external, oil-based paint' in EE notation is Lebhyg Vww).

A fourth feature of the special scheme is that it provides unambiguous working rules for the order in which facets and sub-facets are to be combined. In the English Electric scheme, the order in which terms occur in the schedule is strictly followed, the notation being designed to this end. Examples of the combination of sub-facets have already been given. A combination of facets is illustrated by the class number DdJcJeTdhXy, the successive symbols representing the subject 'Hydraulic turbines, runner blades, thickness, ultrasonic testing'. This could be represented in UDC by the number 621.224-25d: 531.717.1.082.d, which in this particular case does provide a combination order, which is the same as the EE.

The last three features I have noted—clear division into facets, briefer notation and unambiguous combination order—can be illustrated from special

schemes for other fields of knowledge. In a classification for Soil Science (SS),[1] eight primary categories are recognized:

9	Kinds of soil	5	Processes
8	Structure of soil	4	Operations
7	Constituents	3	Laboratory techniques
6	Properties	1	General facet

Sub-facets occur at several points in the schedule, as in the following examples:

Example	*Sub-facet*	*SS*	*UDC*
(a) Kinds of soil	Origin	9g	colon
(9, UDC 631.4)	Climatic type	9h to 9k	631.445
	Physiographic type	9m to 9p	(25)
	Constitutional type	9q to 9tj	631.411
	Textural type	9tm to 9y	631.435?
(b) Soil structure	Profile	8f	631.472
(8, UDC 631.434)	Strata	8i	?
	Horizon	8j	?
	Pans	8k	?
	Aggregates	8kz to 8m	631.434
	Particles	8n to 8v	631.435
(c) Amendment	Materials	4n to 4q	631.82/.89
(4m, UDC 631.8)	Operations	4r	631.81

Brevity of notation may be illustrated by an example from the Amendment sub-facets: the class numbers for the subject 'application methods for super-phosphates' are, SS=4nm-rn, UDC=631.855:631.816.3.

The combination order is unambiguous in the special scheme. The subject 'changes in pH of a podzolic soil as influenced by superphosphate dressings' is represented in SS by 9s6r1f/4nm: here, podzol (9s), pH (6r) and change (1f) follow each other in schedule order, and the oblique stroke (a relational indicator) introduces the 'influencing phase' (4nm, amendment by super-phosphate). The subject could be represented by a colonned combination of 631.445.21, 631.415.1 and 631.855, with no regulated sequence of combination.

The 'general process' section of a special classification for Pharmaceuticals manufacture[2] provides another illustration. The scheme lists 11 facets:

P	Starting materials
Q	Substances to be extracted
R	Chemical reactions
S	Agents of reaction
U	Physical/chemical operations
W	Agents of operations
WT	Properties of agents of operations
X	Scale of operation
XT	Equipment used for reaction or operation
Y	Products
Z	Components of product

In this schedule, no sub-facets are introduced, but six separate places (P, Q, S, W, Y and Z) are provided for substances, according to the roles they play in the subject to be classed. The subject 'the extraction of vitamin B_{12} from liver by alcohol' is represented as PylQsinUlWlce: the notations for vitamin B_{12} (sin) and for alcohol (lce) are both taken from a 'substances' schedule which

1. B. C. Vickery. *Classification and indexing in science*, 2nd edition, London, 1959.
2. Private communication from Dr. D. J. Campbell.

can be used in facets P, Q, S, W, Y and Z. The UDC for the subject quoted would combine 591.436 (liver), 577.16 B_{12} (the vitamin), 66.061.4 (extraction) and 66.062.5'262 (alcohol), giving a longer class number without unambiguous combination order.

A further illustration can be taken from a scheme for Occupational Safety and Health (OSH),[1] which uses the following facets:

(a) Types of occupational hazard
    B   Physical agents and natural phenomena
    C/G Substances
    H/J Premises, equipment, operations, processes
    K   Types of work and industrial organization
(b) Consequences of these hazards
    L   Fires and explosions
    M/N Pathology
(c) Techniques of investigation
    P   Physiology and psychology
    Q   Miscellaneous methods
(d) Protective and remedial measures
    R   Medical prevention and treatment
    S   Safety and health engineering
    T   Personal protective equipment
    V   Safety and health organization
(e) Place of occurrence
    W   Groups of persons
    X   Industries

The subject 'dust sampling methods in coal mines' is represented in OSH as GtzQfzXcf and in UDC as 622.87d.001.4.

The introduction to the OSH scheme emphasizes a point already made: 'The main purpose of a (special) classification scheme is to group together the literature that will most often be used together; the UDC fails to do this, mainly because it does not deal with occupational safety and health as a complete subject.' The needed facets are all to be found in UDC, but widely scattered. Class 613.6, Occupational and industrial hygiene, lists some types of hazard (613.63, noxious gases, dust, etc., equivalent to part of OSH facet G; and 613.64, injurious physical influences, equivalent to OSH facet B). It continues with 613.65, over-work (part of OSH facet P) and concludes with 613.67/.69, military, naval and aviation hygiene (part of OSH facet X). All the remainder of the OSH scheme lies outside 613.6 in the UDC.

TRENDS IN SUBJECT CODING

Before considering what new features could be provided by UDC, it is necessary to look at some other trends in subject coding. Some of the advantages of a special scheme result from its ability to concentrate on only one aspect of a particular term or group of terms. In the OSH scheme, for example, substances are arranged in an order based on their importance as hazards, not on their industrial or commercial importance, their origin or their chemical structure. In a general scheme, none of these aspects can be neglected. One solution adopted by the UDC is to repeat a term in each of its aspects, thus locating it in a number of classes. For example, 'dust' appears in UDC as a general occupational hazard (613.633) and as a hazard specific to engineering (621-784) and mining (622.87); as an air pollutant generally (614.715) and in mines (622.411.5); as an industrial nuisance (628.511) and a target for ventilation (697.98); and as a fluid to be distributed (621.6.04).

1. D. J. Foskett. 'Documentation in occupational safety and health', *Review of documentation*. 1960, vol. 27, p. 102-7.

In any comparison of special classifications, it is very noticeable that the aspects chosen for emphasis differ considerably. This can be seen by following up the generic relations from like terms. For example, in the UDC the classes generic to 'aerofoil' are 'wing section' and 'aircraft element'; in an Aeronautical Engineering (AE) scheme[1] they are 'airframe' and 'aircraft structure'. In the same way, 'corrosion' is subordinated to 'defects', 'materials testing' and 'engineering' in UDC, but to 'chemical behaviour' in AE. The divergence in emphasized generic relations is even more marked if we compare the UDC with a code designed for machine retrieval. For example, in the Western Reserve University (WRU) system,[2] the term 'earthquake' is subordinated to 'ground' and 'disaster', but in UDC to 'seismology', 'geophysics' and 'geology'.

Although special libraries may adopt special classifications emphasizing only one aspect or set of generic relations, they often have to cover subjects from many aspects, and some documentalists are now advocating the principle that a special scheme must cater for many aspects. Some special classifications allow for this by a blanket instruction that all subjects and aspects not covered in the scheme should be 'drawn in' from a general schedule such as the UDC. The value of a general classification is thus acknowledged.

Another trend which has the same result is the use, in machine coding systems, of more generic unit terms or 'descriptors'. Many terms which are simple class numbers in UDC are represented in the WRU system as compounds of generic descriptors, as in the following examples:[2]

Term	UDC	WRU
Bile	612.357	BAFL (body fluid). BWPD (digestive system)
Bile salt	547.93	BAFL. BWPD. DYRG (drug). TURT (medical treatment)
Amphibian	623.438.7	GURD (ground). HUDR (water). MYLT (military). SWHP (marine craft)
Glass fibre	677.52	RESN (plastic). CARM (ceramic). FYBR (fibre). TUTL (textile)

The effect of using generic descriptors is to subordinate 'glass fibre' not only to 'fibre' and 'textile', as the UDC does, but also to 'plastic' and 'ceramic'. As far as symbolism is concerned, the hierarchical, flexional notation 677.52 is replaced by the semantic aggregate RESN.CARM.FYBR.TUTL.[3]

The representation of a term as a compound of more 'elementary', more generic, terms has the further result that different subjects may be represented by the same compound. This occurs even in UDC, but is even more marked in the WRU code. For example, the combination of the descriptors L-CT (electricity), M-CH (device) and N-RG (energy) can represent Battery cascade generator, Inductor or Electric cell. The terms are distinguished by building into the symbolism 'infixes' representing the 'analytic' relations between descriptors. So we have:

Battery	LYCT.MACH.NQRG
Cascade generator	LYCT.MACH.NURG
Inductor	LYCT.MACH.NWRG
Cell	LWCT.MACH.NQRG

In NQRG, the infix Q implies that a Battery or a Cell makes use of, is determined by, or is influenced by energy; the U in NURG implies that a Cascade

1. Classification Research Group bulletin no. 5. *Journal of documentation*, 1959, vol. 15, p. 39-57.
2. J. W. Perry; A. Kent. *Tools for machine literature searching*, New York, 1958, reviewed by B. C. Vickery in *American documentation*, 1959, vol. 10, p. 234-41.
3. See B. C. Vickery. 'Notational symbols in classification', *Journal of documentation*, 1952, vol. 8, p. 14-32, for a discussion of this trend.

generator produces energy; the W in NWRG implies that an Inductor is produced by, acts upon or is acted upon by energy.

As well as infixes for 'analytic' relations, the WRU code attaches 'role indicators' to compounds to indicate their relations within a still larger compound. Thus a Battery used as a component in a machine would be represented by the symbol KAG.LYCT.MACH.NQRG, where KAG is a tag indicating 'subassembly'.

APPLICATION TO UDC

The preceding survey has illustrated a number of features of special classifications and subject codes which are felt to give them an advantage over the UDC: (a) they can bring together all the aspects of a special field of knowledge, aspects which may be scattered in UDC; (b) they can itemize the terms in that field in more detail, yet with shorter class numbers; (c) they can provide for more flexible combination of terms and facilitate synthesis by a standard combination order; (d) they can represent specific subjects, not by ever finer subdivision into more specific schedule terms, but by the combination of generic descriptors; and (e) they can improve specificity by displaying the relations between descriptors in a compound.

Assuming that these features represent trends which are of value to information retrieval, we must next consider to what extent UDC can be developed in the same direction. No definite, detailed proposals are put forward in this study, but some of the possibilities are discussed.

The UDC is an example of a controlled vocabulary of indexing terms.[1] The reasons for using a controlled indexing language are: (a) to economize on the number of distinct terms or symbols used in the catalogue or file; (b) to standardize subject description, so that the descriptions of a subject used by indexer and inquirer are more likely to coincide; (c) to maximize the probability of retrieving all documents relevant to an inquiry and none that are irrelevant; and (d) to provide for specific reference and generic survey to the extent needed by users. In designing an indexing vocabulary, we must consider a number of problems.

SPECIFICITY OF TERMS

How specific will the subjects sought be? Can we safely confound variant word forms, true synonyms, near synonyms? How 'generic' can our terms be? To satisfy the need for economy in the catalogue, our terms should be as generic as possible, but we must be sure that no expected future use will demand specificity we have not provided. The UDC, a general classification catering for a multitude of specialist users, cannot neglect to supply specific terms. Any extension of the use of generic terms in combination, with the elimination of specific terms from the schedules, must be undertaken cautiously.

At present there is an evident trend towards the use of combined generic terms, particularly in subject codes for machine retrieval, and the advantages of the technique are praised. But exaggerated claims are often made as to the generic character of these codes. The following tables compare the specific terms in UDC 669.1 (Ferrous metallurgy) with the corresponding WRU codes.[2] There are 60 specific terms in the UDC schedule, and 25 of these are represented by compound WRU codes. But in so representing them, the WRU uses 52 specific 'semantic factors', as the second table shows. The reduction in specific terms, from 60 to 52, is not very great.

1. The design of descriptor languages is discussed more generally in B. C. Vickery. *On retrieval system theory* London, 1961.
2. J. W. Perry; A. Kent, *op. cit.*

669	Metallurgy	MWTL.SACN.001
-12	rolled	MQCL.MWTL.PWSS.001
	drawn	MWTL.PQSH.2X.PWSS.001
-13	worked	CWNS.MWTL.002
	pressed	PWRS.002
-14	cast	CWNS.025
-15	heat treated	MWTL.PWSS.RQHT.001
	hardened	PUPR.28X.PWSS.004
-40	solid	PAPR.086
-41	flat	MAPR.131
	slab	SAHT.003
	plate	SAHT.002
	sheet	SAHT.001
	strip	MAPR.097
	laminate	SAHT.005
-42	section	LAMN.038
	profile	MYPR.SALT.7X.001
	bar	MAPR.012
	rod	MAPR.003
	wire	CABL.002
-43	block	MAPR.152
	cube	MAPR.002
	cylinder	MAPR.129
	cone	MAPR.025
	sphere	MAPR.093
-45	slot	HALL.007
-462	tube	TATB.001
-47	hole	HALL. 01
	bore	HALL.004
-49	grain	MAPR.041
	powder	MAPR.075
	chip	MAPR.148
	flake	MAPR.160
	fibre	FABR.001
	sponge	MAPR.166
.011	Extraction	SUPR.014
.014	Reaction	RACT.001
.015	Product	PARD.001
.018	Alloy	LALL.001
.018.2	Machinable	CUNS.28X.MWTL.PAPR.001
	Deformable	DYFL.6X.PAPR.004
.018.25	Extra-hard	RYPR.311X.PAPR.28X.001
.018.29	Constructional	CYNS.024
.041	Furnace	MACH.RUHT.005
.046	Heating	RUHT.PASS.001
.046.5	Melting	CUNG.PASS.RQHT.001
	Oxidation	RUCT.116
	Carburization	CQRB.MWTL.PASS.RQHT.006.
.054	Refining	SUPR.023
669.1	Iron and steel	LALL.RERN.ST.FQE.S.
669.12	Iron	MATL.1.FQE
669.13	Cast iron	RERN.CIB.FQE
669.15	Alloy steel	LALL.RERN.AY.FQE.S
669.15.24-198	Ferronickel	LALL.RERN.FQE.NQI
669.16	Pig iron	LALL.RERN.CIA.FQE
669.162.2	Blast furnace	MACH.MWTL.RQHT.001
669.18	Wrought iron	LALL.RERN.FQEM.FQE
669.183	Reverberatory furnace	MACH.RYFL.RQHT.001
669.183.2	Open-hearth	MACH.MWTL.RQHT.RYRN.002
669.184	Bessemer converter	MACH.MWTL.RQHT.RYRN.001

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C-BL.002	wire	-148	chip
C-NG	alteration	-152	block
C-NS	fabrication	-160	flake
-024	contructional	-166	sponge
-025	cast	M-TL	metal
-28	machine	P-PR.028	hard
C-RB	carbon	-086	solid
D-FL.006	deform	P-RD	product
F-BR	fibre	P-RS.002	press
H-LL.001	hole	P-SH.002	pull
-004	bore	P-SS	process
-007	slot	R-CT.001	reaction
L-LL	alloy	-116	oxidation
L-MN.038	section	R-FL	reflection
M-CH	device	R-HT	heat
M-CL	dynamic	R-PR.311	extra
M-PR.002	acicular	R-RN	iron
-003	rod	S-CN	science
-012	bar	S-HT.001	sheet
-025	cone	-002	plate
-041	grain	-003	slab
-075	powder	-005	laminate
-093	sphere	S-LT.007	outline
-097	strip	S-PR.014	extract
-129	cylinder	-023	refine
-131	flat	T-TB	pipe

It is therefore doubtful whether UDC should consider any marked replacement of specific terms by more generic terms which can represent them by combination. Indeed, since one advantage claimed for special schemes is that they cover a subject in more detail, there is a good case for continuing the present practice of introducing more specific terms into UDC by regular revision.

PROVISION FOR FLEXIBLE COMBINATION OF TERMS

The UDC has several devices for the combination of terms to form compound subjects—the colon, auxiliary tables, intercalation and analytical subdivisions. The first three of these are devices whereby one main class number can be combined with another. Each set of classes forms, we may say, a 'common facet'— a set of terms 'common' to the whole scheme, combinable with any other part of the schedule. The analytical subdivisions, on the other hand, are 'special facets', each allowing for combination with certain other classes only in the schedule.

It is probable that changes in two directions are needed, if the UDC is to become as flexible as specialist users desire. First, there are sections of the schedule where the provision of 'special facets'—analytical subdivisions—is inadequate and the existing schedule needs revision or amplification to provide them. This process is already going on at the present time. For example, a completely new extension at 621.039.5, Nuclear fission reactors, has recently been produced, with detailed provision for facet combination. Whenever an existing section of the scheme comes up for revision or expansion in this way, it is likely to be useful if terms are analysed into facets that can be expressed as analytical subdivisions.

This will result in the introduction of an increasing number of special facets into the schedules. To counteract and control this process it is necessary to carry out a continuous survey of the whole scheme, in order to discover the extent to which such special facets are being needlessly and unhelpfully

duplicated in different sections. Such duplication can be avoided by the provision of facets common to a number of fields—if necessary, fully 'common' facets. For example, schedules of chemical materials or of physical properties can be used with the colon device in every field of technology.

Even in those sections of the scheme which already provide analytical subdivisions, it is likely that more detailed analysis will reveal facets over-looked or an unhelpful combination order. An example was given earlier of a subject in the English Electric classification, Coatings, in which eight sub-facets were distinguished. These can only be expressed in UDC as main class numbers, and no help is given as to the order in which these should be com-bined.

It has been argued by D. Kervegant[1] that the combination of UDC class numbers by the use of the colon is *too* flexible, in that the colon gives no guid-ance as to the specific relation existing between the terms linked. He has suggested the introduction of a set of relational numerals, enclosed within arrows. I am doubtful of the necessity for this. To the extent that facets can be built in as analytical subdivisions, a standard order of combining such divisions should specify subjects sufficiently closely. Colonned numbers may be more ambiguous, but relational terms should be introduced cautiously—only to the extent that it is necessary in the catalogue to distinguish between otherwise identical class numbers.

BREVITY OF NOTATION

It can be accepted without argument that notation should be as brief as possible—the word 'possible' implying the proviso 'having regard to the capacity of the agent which has to use the notation'. A machine may not be able to cope directly with a brief notation of complex characters. Some class numbers may be brief but psychologically difficult for the human searcher. But given a set of characters that the agent can use, brevity is the aim.

Notation for the card catalogue consists of numerals, capitals, small letters and a few punctuation marks. A comparison of the notations recorded in this survey reveals several factors affecting brevity.
1. The special notations may be briefer than UDC because they use a larger base—letters instead of numerals.
2. The special schemes also achieve greater brevity by abandoning a strictly 'hierarchical' notation: the class numbers in any one facet do not mirror the logical subdivision of the classes, so that a more economical use of the numbers is achieved.[2]
3. They are shorter also simply because the classification is 'special': the 'main class' is stated in the title of the classification and does not have to be included in the class number. Thus the notations in the English Electric scheme need not include the 621 which occurs in many of their UDC counterparts and the Soil Science notation does not have to include 631.4.
4. Special notations may also be shorter than UDC because they have only to cover shorter 'special' facets, while the corresponding UDC numbers are drawn from more 'common' facets. This may be true even when the UDC number is from an analytical subdivision, if this applies to a large section of the scheme (e.g. the hyphenated subdivisions in 621). It is much more true when the section of UDC gives all the facets main class numbers, e.g., in Soil Science, where an SS facet number 9s6r must be represented inUDC by use of the colon between two main class numbers, 631.445.21:631.415.1,

1. D. Kervegant. 'Développement de l'analyse des relations dans la CDU', *Bulletin de l'Union française des organismes de documentation,* 1958, vol. 26, no. 4, p. 1-5.
2. B. C. Vickery. 'Notational symbols in classification', *Journal of documentation,* 1956, vol. 12, p. 73-87.

or in Pharmaceuticals manufacture, where PylQsinUIWlce becomes 591.436:577.16.B$_{12}$:66.061.4:66.062.5'262.

5. On the other hand, the excessive use of 'common' facets and highly generic terms in combination to express specific subjects can lengthen notation even beyond that of UDC. This is particularly shown in the comparisons of WRU and UDC coding for metallurgy, e.g., MWTL.PWSS.RQHT.001 and 669-15, or MACH.RYFL.RQHT.001 and 669.183.

Of these five factors, it would appear that only the second and fourth can be considered in any revision of UDC, unless an abandonment of numerals for letters were contemplated. The possible advantages of abandoning a hierarchical in favour of a more purely ordinal notation need further exploration. In subjects such as Soil Science, facets and sub-facets which are at present represented by main class numbers in UDC could be changed to analytical subdivisions.

APPLICATION OF UDC TO MECHANIZED RETRIEVAL

The general trend within all indexing systems is to represent the subject matter of documents by a combination, correlation or co-ordination of terms. Instead of a single-word subject heading, subheadings and even sub-subheadings are introduced into alphabetical indexes; instead of a single class number, colonned or otherwise combined numbers are used in the classified catalogue; multiple subject codes are recorded on each punched card; 'co-ordinate' systems use many terms per document. Special faceted classification schemes illustrate the same trend, and I have quoted examples of compound class numbers which combine four or even five facets or sub-facets (e.g. DecswmJbt or DdJcJeTdhXy in the English Electric scheme, 9s6r1f/4nm in Soil Science or PylQsinUIWlce in Pharmaceuticals).

It is beginning to be apparent in practice, however, that the combination of more than, say, three terms in alphabetical headings or class numbers causes difficulties in searching. T. P. Loosjes[1] has suggested that if the subjects to be indexed frequently require more than three terms in combination then conventional indexes and catalogues become inadequate. Two general alternatives are currently available. One is to use mechanically searched 'document cards' (punched Hollerith cards, photographically coded 'microfiches', etc.), each of which is coded for all the subject terms relevant to the document. The other alternative is to use a 'term card' system (Uniterm cards, peephole cards, etc.), each card referring to a single term and bearing records of the documents to which the term is relevant.

In the second alternative, the pack of term cards is in the form of a conventional index and the headings are searched by eye in the usual way. If desired, these headings can be class numbers and the UDC or any other classification could therefore be used as it stands for such a system.

In the first alternative, terms are coded on to cards for mechanical search. Some systems have used UDC class numbers directly for this purpose,[2] but in general this is an extravagant misuse of coding space. Machine-searched document card systems typically cover only a restricted subject field, and two of the factors leading to long UDC notations are felt as grave disadvantages: the repetition of the 'main class' in the class number and the longer numbers of 'common facets'. It seems likely, therefore, that UDC notation is not useful for mechanized search systems, although the schedules themselves provide a valuable source of terms and hierarchies for such systems.

1. T. P. Loosjes. *Types of enquiry . . . and tools for answering them* (paper presented in 1960 in Stuttgart and Milan).
2. R. H. Richens in R. S. Casey; J. W. Perry, *Punched cards*, New York, 1951.

The remarks so far made have been restricted to details of the UDC—its notation or to particular subject fields. There is also persistent critical comment in the literature concerning the general structure of the scheme. Some of the objections to the 'Dewey core' of UDC refer to the artificial restriction of the class structure to an hierarchical decimal notation. A more specific objection is that science can no longer be divided readily into the traditional disciplines which UDC uses as main classes.

Recent writers on physics have made the point. 'The classification of physics', Otto Blüh notes, 'originally followed the types of sense perception (mechanical, acoustical, optical, thermal, etc.). . . . But this method of division has lost its meaning.' Herbert Dingle also emphasizes the change: 'In earlier years physics fell naturally into the conventional groups—mechanics, heat, light and so on; these were separate sciences, in very different stages of development, each following its own line of growth independently of the others. Today the boundaries between them have almost completely gone.' The problem for classification is how to express this unification in a way helpful to the user.

This problem is far from being solved—or even from being seriously studied in detail by the makers of classification. The Classification Research Group in London is exploring the possibility that the principle of 'integrative levels' may be of value in ordering the primary facets of science.[1] The 'substances' listed on page 20 of this reference may provide the basic method of subdividing scientific knowledge—the behaviour of 'ultimate particles', of atomic nuclei, of atoms and so on up a series of integrative levels. But the phenomena embraced by Physics are concerned not only with behaviour at individual levels, e.g. the reflection of light, but also with the interaction of levels, e.g. photoelectricity, the flow of electricity caused by the absorption of light. Any form of material energy can in principle, and so eventually in practice, be transformed into any other, and this interaction of levels needs ready expression in the classification.

Such a treatment of Physics would inevitably draw into it Physical chemistry, with which it already overlaps so much[2]. A reordering of Physical chemistry schedules is already long overdue. In all the general schemes of classification, the schedules are a jumble of all the terms traditionally labelled chemical. Side by side are found particular kinds of reaction between molecules, the internal structure of molecules, particular types of molecular mixture, operational procedures and so on.[3] A tentative attempt to provide a facet analysis of this material has been published.[4] A most useful source of terms and groupings in the classification of Physics and Chemistry is the systematic subject matter index prepared by the Gmelin Institut.[5]

THE SEPARATION OF PURE AND APPLIED SCIENCE

The UDC schedules are constantly criticized for their separation of pure and applied science, but it is easier to criticize this feature of UDC than to suggest how it may be altered. The problem seems to have two aspects: (a) the duplication of subjects in science and in technology, entailing difficulty of choice for the classifier, and (b) the need for easier methods of using pure science facets in technology and vice versa.

1. B. C. Vickery. *Classification and indexing in science*, 2nd ed., London, 1959, p. 170-2, 224-5.
2. B. C. Vickery, *ibid.*, p. 43.
3. B. C. Vickery. 'The inadequacy of current classifications for scientific indexing', *Review of documentation*, 1952, vol. 19, p. 87-91.
4. B. C. Vickery. 'Classification of chemistry', *Abgila* A, 1953, vol. 3, p. 11-24.
5. Gmelin Institut, *Systematik der Sachverhalte*, Weinheim, 1957.

To deal with the first problem, it is possible that certain pure and applied sciences—such as 54 and 66—could be brought together in a single series of facets. The substances of chemistry, their properties and behaviour, the operations and equipment used for them, are essentially the same in both laboratory and manufacture. It may be that a common schedule could be provided, distinguishing between the two fields by a *scale* facet. In revising the Chemistry schedules this possibility seems worth exploring.

The second problem may be illustrated by a special classification for Aeronautical Engineering.[1] The primary facets in this technology are Aircraft and their structures, Conditions of flight, Flying operations and navigation, Aircraft instruments and ground services, Accidents and hazards. But many subsidiary facets are needed to index the literature: Engines, Machine components, Aerodynamic entities, attributes, characteristics and parameters, Materials of all kinds, Manufacturing processes, Physical properties and behaviour, Aviation medicine, Atmospheric phenomena, General technical operations, Testing equipment, Electrical equipment and its characteristics, Managerial operations and Mathematics. For indexing similar material by UDC, the essential need is that all such facets should be freely movable from their own position in the main schedules so that they can be linked to numbers in Aeronautics—without carrying with them irrelevant main class symbols. It would be worth comparing in detail a special classification such as Aeronautical Engineering with the corresponding sections of UDC so as to assess the present flexibility of the latter and to seek further clues to achieving greater flexibility.

SUMMARY OF SUGGESTIONS

This survey of the role of UDC in technical information indexing has not tried to provide a definitive critique or unassailable conclusions. Science and technology constitute too large, complex and varied a field for such a project, and time has been a further limiting factor. I have tried only to give reasons why a number of more detailed studies would be worth making. Here I want to sum up these suggestions.

That schedules should be developed for new subjects such as Plasma physics, the Solid state, Guided missiles or Astronautics is of course recognized by UDC authorities. In addition, a thorough survey of the technology schedules is needed, to pick out sections in which facet analysis can usefully be applied. To counter the proliferation of new 'special' facets, a survey is also needed to correlate and, if possible, combine similar sets of terms into 'common' facets usable at any point in the scheme. A study of 'space' and 'time' facets in the UDC has already been made by E. de Grolier.[2]

A general reconsideration of notation in order to achieve shorter class numbers is needed. The possible abandonment of an hierarchical notation in favour of a more purely ordinal one deserves study. Special facets can be represented as analytical divisions of a subject rather than as main class numbers. On the other hand, devices are needed whereby facets in one field can more readily be linked and in briefer form to numbers in another field.

More extensive revision must be contemplated. In particular, a general reorganization of Physics and Physical chemistry needs to be undertaken, in line with modern scientific views. The possibility of a closer marriage between the science and technology schedules should be studied, Chemistry and Chemical technology being a useful point at which to start.

If studies and revisions of the kinds suggested above were made, can the

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1. Classification Research Group bulletin no. 5. *Journal of documentation*, 1959, vol. 15, p. 39-57.
2. E. de Grolier. *Étude sur les catégories générales*. Paris, Unesco, 1959.

development of the UDC keep pace with the development of science and technology and satisfy the demands that detailed information indexing is presenting to it? Or are there defects in its class structure and notation which no amount of revision can eradicate? It may well be that the re-organizations of the Science and Technology schedules called for, and which I have envisaged in the latter part of this survey, are greater than the UDC structure will allow for. If so, then sooner or later it will be challenged and replaced by a modern scheme. Its size and universality will not save UDC if it is unable to advance with science and technology.

'The great inherent defect of present classification systems', wrote Lund and Taube some years ago, 'is their explicitly stated or implied claim to permanence.'[1] To meet the challenge of ceaseless change, classification needs a bold policy of development. Only the future can tell whether the UDC is itself capable of this development.

1. J. Lund; M. Taube. 'Non-expansive classification system', *Library quarterly*, 1937, vol. 7, p. 373-94.

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