The future of libraries in the information transfer chain

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I am acutely aware that prophesying the future of libraries is well on its way to becoming the main theme of library and information literature, that many if not most of the prophets must be false ones, and that such false prophets are usually among the last to realise it. I am, moreover, conscious that those who point to the writing on the wall too often may be accused of having written it.

It is impossible to consider the future of libraries in information transfer without first looking at the changes that are likely to take place in information transfer, particularly the role of intermediary bodies between producer and consumer. The whole topic is a huge and complex one, and I shall be able to touch on only a few issues. I shall concentrate on science and technology information as befits the general title of this symposium.

First however, I want to take a quick look at social and economic trends in the future, since they will determine the information that is generated, and its distribution and use. Prophecy is always a risky business, but I am neither a politician nor a sociologist nor an economist, and my views may therefore carry some credibility.

In the first place, there will be less money available. Any upturns in the world economy seem likely to be temporary aberrations in a long-term slide from the relative prosperity of the last two decades. At best, a plateau will be reached and maintained.

There seems little doubt, unfortunately, that immense resources, of science and technology as well as money, will continue to be devoted to defence, if not to aggression. At the same time, some of the topics that already concern a few will...
be seen as major and urgent, especially those relating to the husbanding of natural resources and the protection of the environment, not only on the earth but in the atmosphere. Social issues will have to be deliberated as well. These issues require more research and development.

Sophisticated telecommunications will make distance less important: no longer will industry need to consist of very large units, and large cities will have no advantage over smaller communities (rather the reverse). The cost of electronic technology and telecommunications will be low enough for almost every household in developed countries to have access to information in a wide variety of forms, from ordinary TV to extensive data banks.

Within developed countries, stagnant economies and technological advances will result in a decrease of the total number of working hours required. Whether this is looked at negatively as unemployment or positively as leisure, the occupation of spare time in ways that are at worst harmless and at best beneficial to individuals and society will be a major task, and the 'leisure industry' will probably grow faster than any other.

The need to govern, which includes persuasion, will certainly be no less and may be greater, since social stability may be threatened by unemployment. National and local governments will wish to inform, instruct and influence the population, and also to obtain regular and direct feedback in a way that is difficult now but should be much more convenient when nearly everyone is, in effect, on line. The electronics revolution may give rise to problems in society but will also aid in their solution.
If this scenario is roughly correct, there will be some shift from basic to applied research, partly enforced by the need to direct scarce resources where they are required the most, partly by a relative decline in academic institutions as places where traditionally most fundamental research has been carried out. Research institutions funded by government or industry are likely to have an increasing share of research funding and work. Much research will still require laboratories and elaborate equipment, but more research will be capable of being pursued in offices and homes than at present. In particular, access to information can be made available almost anywhere.

Increased leisure, especially among more highly educated people, and a greater desire for understanding and involvement may lead to a more widespread demand for information on scientific and technological developments. To serve this need, research results will have to be synthesized and partially popularized, in the manner of the *Scientific American* or *New Scientist*. Technology will make possible a greater flexibility in the presentation of information. Words, pictures and sounds can not only be integrated (as available at present), but the integrated form can become much more general, resulting in better and more appealing communication.

The decline in resources given to education may be partly compensated for by much greater opportunities for self-education. In fact, this could be beneficial. Knowledge keeps changing, but although the notion that an individual's education is finished when one leaves school or university is ludicrous, few changes are made in the present system. With self-education, the individual can learn in his own way at his own speed. Educational programs and facilities available on or through TV will find it difficult to compete with more obviously popular programs, though the success of some instructional programs in the past should be encouraging. At any rate, efforts must be made to ensure the availability, everywhere and all day, of self-educational channels, perhaps with the support of videotapes or videodiscs, whether individually owned or called up as required on the screen.

This brings me to the future form of scientific communication, and inevitably to the so-called electronic journal. It has been pointed out that this term comprises two concepts: the conventional journal in an electronic form, and the ability of individuals to communicate research ideas, findings and comments to one another in what might be called electronic correspondence. The two concepts are not clearly separated. After all, it was scholarly correspondence that led to the first scientific journals, and 'electronic letters' can evolve into scientific papers. The distinction is nevertheless useful, since direct telecommunication between individual scientists using computer terminals is different from papers. It is the latter with which we are concerned here.

After much debate in recent years, a consensus is emerging that the availability of scientific papers in electronic form will be gradual; that it will in the first place affect only a minority of shorter papers ('letters' journals) and high-use journals, that it will be at least ten years before a majority of papers are available in this form, and that electronic forms will exist alongside conventional forms, some-
times for the same journals. There are several paradoxes to be resolved. In the first place, the high-use journals are economically viable in their present form and seem likely to remain so for at least a decade or two. Therefore the electronic form will be competing with the printed form, just as the printed scientific abstracting and indexing journals compete with on-line usage. As far as I know, the printed versions of these A & I journals are still subsidizing on-line availability. When the balance of use shifts, as seems likely to happen soon, if it has not happened already, will the printed versions be subsidized by on-line use, or will the printed versions cease to be produced? In either case, how will on-line costs be affected?

The journals suffering most from the economic climate are not the high-use ones, nor indeed low-use ones that are produced often as status symbols by academic and research institutions willing to subsidize them, but medium- to low-use commercial or society journals that many libraries can no longer afford to buy. These last journals might be rescued by being made available in electronic form, whether for reading on a video screen, for printing out at a receiving terminal, or for printing on demand at a centre or centres for subsequent distribution to the requester. However, the journal articles must first be put into a suitable electronic form. This should be neither difficult nor excessively costly. The articles must then be kept available either for on-line access or, less expensively, for central printing. Since income depends on usage, and since many articles receive little usage (the identity of low-use articles is concealed in the printed journal, whose use is rarely monitored by the libraries that are its main market), electronic storage and transmission could make the whole journal, or at least some of the articles in it, economically unattractive, unless costs involved are very low or unless authors or their parent bodies pay for deposit in the electronic store. For this reason, printing on demand at storage and supply centres may prove a better alternative than on-line access, as well as giving the producer a little more control over the product.

Numerous disadvantages of the conventional journal have been enumerated. Among them are slowness of publication and slowness of access if the desired issue is not available locally. The first point is accepted, but supply that is fast enough for nearly all users and purposes can be achieved by conventional means. A bigger problem than speed in itself is probability of rapid service: a system that can achieve a fast supply for less than 70% of wanted items is not good enough. For this reason, comprehensive and efficient document supply centres (of which the British Library Lending Division may not be a perfect example, but it is probably the only one) can perform much better than cooperative acquisition and interlending systems, however well funded, planned and operated. Electronic storage and transmission offer a solution that may be independent of national boundaries.

Whether or not low-use commercial or society journals are made available electronically, their continued existence in printed form is doubtful. A recent report from King Research Inc., suggests that conventional journals, in the United States at any rate, showed very substantial growth in sales between 1976
and 1980 [King Research Inc., 1982], but the situation has probably deteriorated substantially in the last two years. Journal cancellations by libraries in nearly all industrialized countries are reaching frightening levels. While one may be surprised that some of the journals cancelled were ever published, let alone bought, their disappearance must nevertheless reduce the amount of available recorded knowledge. If shrinking library budgets are likely to kill off some low-use journals, it must be remembered that libraries are the main market for nearly all high-use journals. What befalls libraries will affect critically what happens to scientific communication. The disappearance of libraries would mean the disappearance of most printed scientific journals.

The reverse is also true: what befalls scientific communication will affect critically what happens to libraries. The chain of scientific communication runs from the author to the user, at present usually through the publisher, who selects and gathers the current work of authors, then edits, stores, produces and markets it, and finally the library, which gathers together the past and present products of publishers into collections for the convenience of the user. Between the publisher and the library is a less clear area—let us call it the Middle Ground. This is occupied by wholesalers and retailers—booksellers, journal agents and so on—who act as intermediaries, so that every library does not have to approach every publisher directly, nor does every publisher have to make his product directly available to every library (or, even worse, to every individual).

Electronic technology is bound to affect this chain. Not only can the author communicate directly with the user by electronic letter, but the user can bypass both library and retailer for direct access to the publisher's material. Even if the user goes through a library for most of what he wants, this does not benefit the retailer. Assuming that there still must be a role for the publisher, there is a large fluid area between him and the user. Another name for a large fluid area is a lake, in this case a superficially attractive but a deep and rather viscous one. It is unlikely that all publishers will individually wish or be able to make their electronic products available directly from themselves, any more than producers of abstracting and indexing journals personally provide direct access to their databases. In the case of A & I journals, the Middle Ground is occupied by data-base hosts, but they mostly provide on-line access rather than on-demand printing, which would be a far bigger operation with primary publications, especially if an ever-decreasing proportion of what users want is locally available.

What happens with the Middle Ground is a matter of uncertainty, great interest and importance. The publisher is keenly interested in it. Almost certainly he will not be content to sell his wares to middlemen and leave it at that, both for current financial reasons and for his future planning (the publisher will want a cut on payments for use and will want to know what is used and how much). On the other hand, there would be dangers if the Middle Ground were left entirely to commercial interests. As mentioned previously, many papers could become completely unavailable if their existence depended on use and economic return.

If the British Library Lending Division, which is renowned (if not notorious) for supplying more individual journal articles to libraries throughout the world
than any other organization, were put on a footing of total cost recovery (not profit), and ignoring the purchase and supply of books, the prices charged for articles would have to be at least doubled. Demand on the Lending Division is already declining as library budgets in the UK get even tighter, and a doubling of prices would reduce it further by a very large amount—at least a third, probably more.

It is, incidentally, a fallacy to suppose that interlending demand goes up as library acquisitions go down. The two tend to move in the same direction, with interlending lagging about two years behind acquisitions. The reduced demand would necessitate a further increase in price to recover costs, and a vicious spiral would be set in train. The ultimate sufferers would be users. If however, the Lending Division bought only the top 5,000 or 6,000 of its 55,000 current journals, which are the core titles that account for 75% of all journal demand [Clarke, 1981], the operation could be run on fully commercial lines at economic prices without difficulty.

In such a case, who would supply the rest, and on what terms? It could be left to the old-fashioned, inefficient and discredited system of interlending between ordinary libraries, which might be fairly cheap in visible costs (though not in hidden costs), but is usually slow and uncertain. In any case interlending depends on the chance that some other library has acquired the wanted journals in question or on a cooperative acquisition scheme. Alternatively, publishers could supply lesser-use journals, either individually, in which case a very poor supply could be expected for most, or by some cooperative system, which might involve reinventing something like the British Library Lending Division. Either way, costs and charges could be very high, and there would be something absurd in a system that involved much higher fees for articles in low-use than in high-use journals. Separate systems for high-use and medium- or low-use journals would be very inconvenient to use, especially as constant relegation and promotion of journals occur between the categories.

Other factors than the above would come into play if the items in question were, say, digital optical recordings (DORs) rather than printed journals. At present, publicly funded libraries do what publishers cannot or do not wish to do, namely maintain vast storehouses of past documents and retrieve from them on demand. Storage and retrieval costs should be much lower with an electronic system, but the general principles still apply: the economics of supplying articles from any but high-use journals are uncertain, what ever method is used.

Users as well as publishers have a strong and legitimate interest in the Middle Ground, and there is a strong case, on the grounds of national and social interest, for the Middle Ground to remain at least partly in the public sector. If this is true for currently produced material, it is even more true for the preservation of material for future use—its retention, its maintenance in a usable form, and the assurance of continued access to it. These are essential functions, which have traditionally been performed by a national library. They could become very difficult, if not impossible, if electronic masters were entirely in the hands of publishers. Publishers are not guaranteed eternal life, and they could in any case
hardly be expected to accept such a national responsibility, which must surely fall on a public body.

These considerations point to joint public/private ownership of the Middle Ground. This should be achieved by discussion and give-and-take rather than after a prolonged battle, which would benefit none of the interested parties, least of all users. There is another reason why this is desirable: it would be difficult to prevent the transfer of electronically transmitted material to a local electronic store, from which a kind of pirate service could be given. Piracy becomes more attractive as more restrictions are placed on access to databases and higher charges are made for their use. Conversely, the more open the system the less the danger of piracy.

The investment required for electronic publishing is such that most publishers cannot contemplate investing on their own, certainly not many publishers of the less-used journals that might benefit most. One possibility is of course for publishers to cooperate and pool resources for their mutual benefit. Consortia of this kind could be confined to the major publishers—those who are able to put most money into the pool—or those who could allow for associate membership on special terms for other publishers who have not themselves invested. However, much interest is now being shown by major commercial concerns that hitherto have had little or no involvement in scientific and scholarly publishing but have an interest in the relevant technology or believe there is money to be made in electronic publishing. They can afford to take risks in a field that is changing and developing so rapidly that some risk is inevitable. There may be takeovers of long-established publishers, and in a few years scholarly publishing, or at least a sector of it, may no longer be a specialist business but part of much larger and diversified industries. This trend too carries grave dangers for scientific and scholarly communication, because what is added on to a large concern can easily be cast off as expendable, and by the time that happened there might be no-one left in specialized publishing to take it up again.

Can or will the local library be cut out of the communication chain, if and when electronic publication comes to constitute a majority of published material? Users will be able to have direct access to databases from terminals in offices and homes, so why go through libraries? One possible answer is that individual users may not be able or prepared to pay for access themselves. However, departmental or other institutional funds can be used as easily as library funds; even if databases are accessed at home, use can be billed to institutions. If commercial bodies acquired the most used journals and made them available on strictly commercial terms, there would be competition for the individual user market between private and public suppliers. This market could be won by the private suppliers because publishers might favour them, and because libraries might be compelled by hard economics to charge users for documents, as many already do for access to secondary services, so that there would be no benefit for users in going through libraries. In this case, libraries would be left to provide users with access to the large but uncommercial residue. This might or might not be very expensive, depending on whether the Middle Ground was occupied by the public
or the private sector. This is an unappealing, but not in fact an impossible role for libraries; it would be not wholly unlike the situation with books, where nearly all paperbacks are bought by individuals, while most academic hardbacks are bought by libraries.

One reason why libraries might be used for access to articles, in preference to terminals in offices or homes, is that (I am convinced) most reading (as opposed to quick reference) will continue to be of print-on-paper, not of displays on screens. The advantages of paper have been pointed out more than once. Among them are quick visual scanning, portability, capability of annotating and highlighting, and ability to work with several items alongside one another. Cheap printers will become common but the high quality printers necessary for a good readable product, especially if illustrations are involved, will be within the reach of relatively few owners of computer terminals. Thus, the library could become an intermediary organization, providing access to remotely stored material in acceptable printed form.

Some other kinds of information that are at present normally provided as print-on-paper, mostly through libraries, are even better candidates for electronic storage and supply than high-use scientific journals. Reference works, however often they are updated, are never completely current, and also they are often very expensive. Print-on-paper will continue to be a very convenient format for such quick reference works as language dictionaries, though these will surely be produced from electronic originals. Encyclopedias and handbooks such as Beilstein and Gmelin, and compilations of statistics, are almost purpose-made for electronic access. Since printouts will not be needed for most inquiries, there seems to be little reason why such works should not be consulted via any terminal, including television screens via videotex Gateway systems.

The library need not be merely a switching centre, obtaining articles on demand from an external source. It could acquire DORs or other electronic media and make them available locally. It would need the appropriate equipment, the cost of which could put it out of reach of all but large or well funded special libraries. More important, perhaps, is the question whether publishers would allow copies of their master recordings to be acquired (or leased) except on restrictive conditions and financial terms that would make it unattractive and uneconomic for the library.

That there will be some role for some libraries for many years to come is beyond reasonable doubt. Not only is conventional publication likely to continue for nearly all books and many journals, especially in the humanities and social sciences, but there are vast quantities of previously published material that must continue to be made available. Shortage of space may enforce the gradual relegation of much of this material to regional or national stores, and in the long term a good deal of it may be converted to electronic form to ensure its preservation, in which case it could be made available from a centre or centres in the same way as current publications. However, it will be a very long time before such measures obviate the need for a local library. These considerations apply to academic libraries, not to industrial or other special scientific libraries, which take
little or no non-scientific literature and rarely retain much literature of the past—at least, not if they can have fast and easy access to a central source of supply for journals whose period of heavy use has come to an end. At the same time, as suggested earlier, every library that closes down reduces the market for conventional journals and thus accelerates their demise, as a vicious spiral comes into operation; and the decline of a publicly funded market (which is what most large libraries constitute) could cause severe problems for electronic journals also.

What is the long-term prognosis for local libraries, once the transitional stage between print-on-paper and the electronic storage and supply of scientific and technical journal literature is over? General academic libraries will continue to hold non-scientific literature in conventional form and provide books for students. Larger libraries will provide access to, and printed copies of, remotely stored scientific literature; but much usage will be direct between information stores and home and office terminals. Smaller scientific and technical libraries will have no role left—those, that is, that survive the latest round of economy measures taken by industrial firms, whose tendency to scrap first one of the smallest and most cost-effective items in their budgets is a sad reflection of the failure of the library and information community to sell itself to industry. The tendency of industrial units to become smaller may accelerate this process. (Public libraries raise much wider issues, and I am deliberately excluding them from this discussion.)

One role foreseen for libraries by several writers is that of a centre of information expertise and advice. With all these databases about, how is the poor user to find his way around? He cannot even find his way around a conventional large library; few scientists are familiar with all the relevant secondary services in their fields and, left to themselves, they will miss much that is potentially useful to them. I am not sure about the strength of this case, although I have argued it myself in the past. It is not difficult to conceive of an automated retrieval system that allows a user to start with a keyword, leads him on to specify more closely his area of interest, indicates databases containing relevant items, and then searches some or all of them as required. The psychological barriers that exist at present between users and libraries should cease to exist. They would be replaced by other barriers: it may not be so much fun consulting one's terminal as one's librarian, but that depends entirely on one's librarian, and business and pleasure may have to be separated.

Such a Super-Access System does not yet exist, but meanwhile a human equivalent in the form of information brokers is emerging in the United States and elsewhere in increasing numbers. Their market is presumably the smaller business or industry that does not have its own library or information service, but they could go further and make existing small local libraries unnecessary. They may do everything from search formulation to document provision, and since they are competing with one another, they will need to give good service to survive. They exemplify the increasing commercialization of information and the growing competition between subsidized (locally provided) libraries and the private sector. Individual users may even be tempted to use costly but efficient
private services in preference to less efficient but 'free' local libraries.

While the prospects for local libraries in industry and commerce seem poor, then, academic libraries look to have a more secure future. Apart from their need to provide conventional publications, the total usage of literature by researchers in a university should be great enough to justify extensive—and expensive—equipment for accessing databases and printing out as required, and also to justify a highly competent staff—the university's own information brokers, in effect. There should be economies of scale in a central information facility compared with decentralized access, though the latter will undoubtedly occur as well. Even if and when 'Super-Access' is available, some users will almost certainly prefer to delegate the use of it to information specialists. A university could go further and make all its information facilities—expertise, access, and printing—available to other organizations in the locality or region, especially to local industry, so recovering all of the direct costs of offering its services and also a contribution to the capital costs involved. A role as information broker for the region could be very attractive.

These prospects need not assume that universities continue exactly on their present lines. If the arguments presented in the earlier part of this paper are sound, higher education as a once-off process should gradually yield, for economic and social reasons, to continuing education. This would partly take the form of self-education, some of which can be done at home but for which libraries, either in their present or in a future role, should be ideally suited. The university would then become a much more open institution, with many more participants, most of them part-time—an institution of continuing learning. Learning as a solitary process, even with an interactive computer, is deficient in excitement, stimulus and colour—qualities that only human interaction can provide. An open university consisting of hundreds of scattered individuals seated at their terminals is a much less appealing prospect than an institution where learners can meet and discuss—an institution not only of self-education but of mutual education. Such a prospect is quite realistic in the social sciences and humanities, while in science and technology the need to use expensive equipment will encourage use of the university as a place to go to, as well as to use remotely. At a less advanced level, for the reasons stated earlier, science and technology need wider dissemination, understanding and discussion, and multi-media such as television, combined with the written or spoken word and supplemented by face-to-face discussion, can do far more to aid dissemination and understanding than textbooks. This requires both a huge extension of library functions and a total integration with the university's broader functions.

There is another role that will increasingly need to be filled and that might be filled by libraries. In a world where vast quantities of information are immediately accessible, information input overload (or, as I like to think of it, BO—Bibliographic Overload) will become even more of a problem than it is now. Some filtering will be needed—not only selection of references, but digesting of documents. This is done at present for senior researchers by assistants; newcomers have generally to fend for themselves. It involves intimate knowledge of the
research and great trust on the part of the researcher. Some libraries and information units have already gone some way in this direction, but only a little way and only with some researchers. To go further would require different skills, and possibly different personalities from those traditionally associated with librarians; but we are, after all, talking about the future, not tradition, and if certain characteristics are needed, it will be up to the educational system to produce them.

What actually happens to libraries will depend on many things. One of these is the Middle Ground and its ownership. Another, which is related, is the balance between libraries of a more or less conventional kind and commercial information brokers; whether there will be creative tension or destructive competition remains to be seen. The whole issue of information economics is likely to be a dominant one. Information costs money to create, store and access, and the world can no longer behave as if it did not. Yet information is also a public good, and libraries can have a very important function as links between commercial sources and users. Without this intermediary role, access to information will be confined to relatively few, privileged people. Libraries already have this function of equalizing access to information, and it is possibly their most important and enduring one. The importance of access to information is becoming greater still, though the way in which it is achieved must surely change. Moreover, as noted earlier, the erosion of publicly available and publicly funded access would affect, in turn, the private sector. The ecology of the information world is a highly complex and delicate one, and while it need not remain stable, any disturbance of it must be planned with great care.

As I have already indicated, as electronic storage, access and supply grow, some tension between private and public sectors is inevitable. If the right balance is to be achieved by collaboration rather than conflict, a continuation is needed of the sense of mission that most successful scholarly publishers have managed to combine with a hard commercial sense. On the part of the library and information community, there will be a need for greater economic realism, the vision to imagine possible futures, commitment to serving users, whether or not they are able to buy information directly, and courage to discard outworn functions and grasp new ones. The likely alternative would be a total market economy of information, for which the whole world would be poorer.

To summarize. The future world will be one of more leisure, smaller communities and industrial units, more direct access to information of all kinds at home and in the office, and more open and continuing education. Research interests will shift somewhat towards social and environmental concerns, and better communication between government and governed will become vital.

Although electronic storage and transmission of information will grow, much material will continue to be published in conventional form, and most electronically transmitted information will be produced and read in printed form at the receiving end. Commercial interest in information storage, transmission and use will increase to the extent that electronic publishing may become a minor activity of firms with much broader interests. There will be some tension between the
public and private sectors in information supply, especially in the Middle Ground.

Libraries, which constitute the public sector at present, have several traditional functions: providing access to documents, providing bibliographic access and assistance, and providing a quick reference service. The last of these will be the first to go in an electronic age, followed by the second. The first, access to documents, will never disappear entirely in academic libraries but it may be gradually eroded and even disappear in special scientific and technical libraries, which in consequence may themselves disappear. Other functions could replace those lost in academic libraries: a role as information brokers, a publicly accessible educational media and learning center, and the filtering and digesting of information for users. Such developments would change the library into a Learning and Information Processing Unit, an institution of a radically different kind.

Libraries, publicly funded ones at least, represent much of the public interest in information access, and the continuance of something resembling them is a matter of more than sentimental concern. In particular, public and private interests in the Middle Ground must be reconciled.

I am afraid I have put before you a lot of ideas, many of them not fully thought through. This is not for lack of thinking, but because I have not yet seen my way through. The next few years will be difficult years: years of experimentation, of dead ends, of money well invested and of money wasted. In some ways it is easier to see the long-term than the short-term future, but how publishers, libraries and users behave in the short term will largely determine the long term, and the fact that the short term for many libraries seems fairly secure must not allow librarians to become complacent. If we are, our successors will not thank us. There may indeed be no librarian successors to thank us or curse us, and this need not matter: what does matter is that there will be users to thank or curse us.

References
