THE HISTORY AND HISTORIOGRAPHY OF INFORMATION SCIENCE: SOME REFLECTIONS

W. BOYD RAYWARD

Faculty of Professional Studies, University of New South Wales, Sydney 2052, Australia

Abstract—The first part of this paper examines some of the difficulties for the historian of information science that arise from the lack of agreement as to what precisely constitutes information science and from its commonly accepted interdisciplinary nature. It examines in this connection Machlup and Mansfield's ideas about a "narrow" information science and information science as a composite of disciplinary chunks. Regardless of these issues, it demonstrates that the history of information science is gaining an identity both bibliographically and socially. The second part of the paper suggests that as a condition of their organization, reproduction, and control all societies have evolved their own distinctive ways of managing information. Ultimately, then, the history of information science can be considered to extend far beyond the last 50 years where attention is commonly focused. Drawing on Braudel's notions, *durée longue, moyenne* and *courte,* the paper suggests an approach to periodicity that provides a new perspective for the history information science. The paper also introduces the notions of synchrony and diachrony to suggest other approaches to the historical study of aspects of information science. The paper concludes that the history of information science is an historical interdiscipline and those interested in it need to draw on a range of related historical studies such as the history of science and technology, the history of printing and publishing, and the history of information institutions such as libraries, archives and museums.

A BACKGROUND OF PROBLEMS OF DEFINITION AND INTERDISCIPLINARITY

One of the most serious problems confronting the historian of information science is knowing what it is that he or she is studying. Is information a process or a product? Is it text or document, the content of verbal communication, an expression of meaning, a statistical phenomenon of signal transmission, the processes of symbol representation and manipulation by electronic machines, biophysical activity of the brain, a matter of genetic or biochemical structures and processes? The historian of established or traditional scientific disciplines such as astronomy, of aspects of the man-made material world such as railways or music, of abstract concepts or ideas like progress or human rights, have the touchstone of something that has become conceptually recognizable, identifiable, delimitable and relatively stable. They have a history! There is a linguistic pot for each of them, the shape and contents of which have changed and will continue to change with the passage of time and the reconstitutive and deconstructive activities of generations of theorists and historians. But whatever the changes, at least the pot is understood still to be there, a product of all of its previous avatars.

There is a fundamental problem for some in the use of the word "science" in this connection. Is information science really a "science"? How are we to assimilate into it the notion of technological development that is so striking a part of what we casually designate information *science?* How are we to relate the professional practice or service elements to the science? Is there an information professional whose work is at once supported by, as it helps to determine, the research and development agenda of an information science? Is it appropriate to deal with the problem as Machlup and Mansfield have done essentially by dismissing it, as we have done with respect to library science also (Machlup & Mansfield, 1983; Rayward 1983a)? Has the kind of narrow understanding of what constitutes science and a lack of awareness of the potential interrelationships of science and technology, that Buckland in his article in this issue of

Information Processing & Management suggests characterized the Graduate Library School at the University of Chicago in its early days, held back the development of modern information science (Buckland, 1996)?

There is certainly for some a real issue as to the value and validity of characterizing information science as a "science," as opposed to something which is merely imitatively and perhaps inadequately "scientific." This latter view has animated a number of discussions of information science as well as "library Science." (Wilson, 1983; Bennett, 1988; Hauser & Schrader, 1978; Schrader, 1984). The approach we adopt is to accept for the time being the current usage of the term "information science" as it has developed over the last 40 or 50 years and to attempt to understand what is to some degree problematically denominated by it.

While "information" itself is a word long in common use—since 1450 as "that of which one is apprised or told; intelligence, news (OED)"—"Information Science" is a phrase that has come into use essentially as a product of the computer revolution and thus only since the second world war. And "no agreement exists about its object or objects" (Machlup and Mansfield, 1983, p. 16). The term represents something that is new, emergent and as a result shifting and unstable in its signification and, because what is meant by "information" varies so widely according to the backgrounds and perspectives of individual investigators, may be more appropriately referred to, as Machlup and Mansfield (1983) suggest, in the plural. Machlup's analysis of "semantic quirks in studies of information" brings this point home (Machlup, 1983).

At one extreme, almost everything could be argued to be information. The history of the universe would then become the history of information processing. The history of humanity becomes the history of information processing within a social context. If everything is information, then not only is all history the history of information, all scientific work is information science. How close one can come to this kind of argument is exemplified in Donald Mackay's "The Quantal Aspects of Information." Mackay suggests that the apparently 'hard' science of physics is epiphenomenal to the real science of information: it was because information was inherently quantal that physical reality was discovered to have the same property (Mackay, 1950).* The breadth of this kind of approach only makes sense if information science is seen as a metadiscipline directed at understanding the explanatory strategies of other disciplines.

A less extreme view is represented by Machlup and Mansfield's suggestion that "in the broadest sense" information science is "a rather shapeless assemblage of chunks picked from a variety of disciplines that happen to talk about information in one of its many meanings" (Machlup & Mansfield, 1983, p. 22). Machlup himself distinguishes one group of meanings in which the ideas of meaning and cognition are central: "the general sense of something being told to somebody, where this somebody was supposed to grasp what was being told." Another set of meanings is more "metaphoric" and is used in relation to "descriptions or models of processes or phenomena pertinent to living humans or, more generally, to 'living systems' " (Machlup, 1983, p. 651).

The interdisciplinarity of information science is a continuing theme in attempts to define it. One approach to definition is to focus not on information as the phenomenon to be studied but on the idea of the system in which it is organised. For Borko, for example, "information science is the theoretical discipline concerned with the applications of mathematics, systems design, and other information processing concepts; it is an interdisciplinary science involving the efforts and skills of librarians, logicians, linguists, engineers, mathematicians and behavioural scientists. The application of information science results in an information system. The role of information science is to explicate the conceptual and methodological foundations on which existing systems are based" (Borko, 1968, p. 67). Hayes propounds a not dissimilar view: "information science is the study of the means by which organised structures (which we call 'information systems') process recorded symbols to meet their defined objectives" (Hayes, 1985, p. 174). He suggests that what constitutes a system is limited only by imagination.

Shrader's important paper on the conceptual antecedents of information science identifies yet another approach to understanding the confusions and conflict that surround information science

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* I owe this idea, the reference and much of the wording above to Geof Bowker.

as an identifiable field of study (Schrader, 1984). In a sense he deals with a different kind of interdisciplinarity that involves not the apparently related, established, disciplines from which borrowings have occurred but closely related antecedent areas that remain as it were part of the genetic make-up of information science: bibliography, documentation, scientific information, and information retrieval, for example. This approach is not dissimilar in its historical dimension from that adopted by Rayward in discussing a historical dynamic of disciplinary differentiation, competition and convergence that helps explain the development of information science (Rayward, 1983a). Schrader constructs a disciplinary chronology that identifies some 40 terms in seven categories that historically have been used for aspects of what we now call information science. He paints a picture of "terminological chaos" that reflects the evolution of the field in the last eighty years or so and the lack of scholarly consensus as to how it is now actually constituted in terms of the theoretical underpinnings that alone can give it intellectual coherence and respectability. What is the object of the domain and the scope of enquiry that it encompasses? To these questions historically understood, he adds a normative concern for what has to be seen as a special and limited kind of theory-building and for "consensible knowledge" that must give the historian pause.

LIBRARY-AND-INFORMATION SCIENCE AND COMPUTER-AND-INFORMATION SCIENCE

In two cases terminological juxtaposition expresses important relationships between related "disciplines" and information science in useful though not simple ways. On the one hand Library and Information Science and, on the other, Computer and Information Science may represent separate but cognate subjects, a relationship perhaps better designated by Machlup and Mansfield's "plural *s*" and, one might add, the definite article—the library and information sciences, the computer and information sciences (Machlup and Mansfield, 1983, p. 19). But the expression may also be a form of specification of different approaches to or aspects of a discipline: library-related information science and computer-related information science.

But how well does this distinction hold up? For Machlup and Mansfield, library and information science is information science as it bears on "technically improving librarianship" by applying "new technology to traditional library functions of acquiring, storing retrieving, displaying, and disseminating records" (p. 21). On the other hand, their "first question about computer science . . . is whether its subject is the computer itself, a highly complicated machine or rather what is being done with computers, namely, the processing of all sorts of information" (a comment equally apt about the library and library science). They decide that "the enormously complex task of designing, programming, operating, and maintaining the all-purpose digital computer gave rise to the development of a separate discipline, *computer science*" (p. 23). Computers, though originally used for processing numbers, now also "manipulate entities that are symbolic representations of other things" and they speculate that a large proportion of their use is now manipulating "non numeric contents" such as "texts, images and graphics" (p. 24).

It can be argued that this kind of distinction is quite unsatisfactory. The word "library" substitutes exactly for "computer" and "digital computer" in the quotations above. We might describe the modern library as a system of processes, human practices and technologies, nowadays centrally involving computers. As such the library is, in effect, an organization or metaphorically a kind of "machine," if you will, for manipulating numeric contents (e.g. statistical databases) and the non numeric contents of what we call documents which consist generally of texts, images and graphics. Traditionally the creation and manipulation of symbolic representations of the contents of documents—catalogue records of various kinds and for various purposes—and the collection, preservation and presentation of the physical objects which contain the actual text, images and graphics—and sounds—have been professional tasks for librarians.

The notion of what constitutes a document, however, is not simple and indeed can be seen as recapitulating some of the ambiguity and variability that characterizes the notion of "information". The librarian's traditional understanding of documents as involving the printed page is seen by some as unduly restrictive both conceptually and professionally. There has

recently been some interest in reassessing the enlarged notion of document that underpins the European "Documentation" movement that derives from the work of Paul Otlet and his colleagues in the early years of the twentieth century (Rayward, 1975). For them "documents" are whatever carry meaning, including printed and written texts, images, graphic and schematic representations, and objects. They all have "evidentiary," "documentary" value (Otlet, 1934, 1991; Rayward, 1994). Following up the observation of Suzanne Briet, one of the early documentalists, that a catalogued antelope is a primary document, Buckland has recently been examining the idea of document as "thing" and "more than text" (Briet, 1951; Buckland, 1991a, b, 1995b).

As the format of documents that have been traditionally the library's concern become increasingly electronic only the computer's general computational functions, that make it such an indispensable data processing tool for the laboratory and office, distinguish it from the library. Perhaps with the advent of supercomputing, the highly complex and intensive computational functions that are its domain may be so dramatically distinctive as to make the analogy to the library seem overly simplistic or wrong. And at another extreme, one might see the increasingly ubiquitous personal computer on desks, laps, and in the hand as standing to libraries in a capacity little different from the adding machine or slide rule of earlier times. It can be argued, however, that the library's special functions of capturing and processing documents for subsequent public consultation and the research into these functions that has hitherto formed a highly applied and limited discipline called "library science," are increasingly being subsumed within the evolving general functionality of computer-based systems and the research and development based on them.

"NARROW" INFORMATION SCIENCE AS INFORMATION SCIENCE

Machlup and Mansfield describe a "narrow" information science that one day might form a discipline distinct from library and information science and computer and information science. They list a number of research projects that information science so defined might encompass:

> "Studies of patterns of communication among scientists and scholars (e.g., co-citation analysis); studies of improved methods of classifying information (e.g., computer-based cataloging of documents); statistical studies of the growth and distribution of the literature (e.g., the area known as bibliometrics); novel methods of information exchange (e.g., electronic information networks, teleconferencing); control of access to information (e.g., government regulation of information transfer, international communications conventions, etc.); modeling and computer simulation of information systems and networks; studies of the character and behaviour of users of information systems and services; studies of human factors involved in the design of man/machine systems and so on" (p. 22).

It can be argued that what has been described does in fact have disciplinary coherence already (Rayward, 1983b). A characteristic set of problems for research and the existence of a distinctive if limited methodological approach for at least some of these problems have been identified. There is a considerable research literature on all of these topics, including a "historical" literature about their origins and development over periods of time. They animate the theoretical and applied work of an academic community of researchers and teachers. They underpin various industrial and professional research, development and service initiatives. Machlup and Mansfield themselves raise the issue that this "narrow" information science might actually be part of either library or computer science—and so it would be if one added to their list of topics studies of library management and library-specific practices on the one hand, or computer and software engineering on the other.

But the concern is surely misguided. What has been identified is a substantial overlap between two fields, of convergence from two different disciplinary directions on a basic set of problems or projects, which should not be understood to have been exhaustively enumerated above by Machlup and Mansfield, for information science. That this set of problems or projects can be approached from the special perspectives of what may be regarded as one or other of the "core" disciplines, and that other problems or projects from these disciplines can be added to the basic

set, simply recognizes that there are no sharp boundaries nor established priorities for information science when defined in this way.

INFORMATION SCIENCE AS A COMPOSITE OF DISCIPLINARY CHUNKS

A major question arises for the historian, as for the disciplinary expert, when one discusses the "chunks" of disciplines that might be said to fall within the ambit of information science—cybernetics, computer science, library science, cognitive sciences, artificial intelligence, general systems theory, linguistics, information theory and so on. How do we know confidently that we are writing the history of information science rather than simply a history of cybernetics, for example? Does it matter? At what point can we say that histories of libraries or of computing or of communications contribute to what might be seen as the more general history of information science? To what extent does the historian of information science need to seek roots in the special disciplines and subdisciplines that bear on the study of information in its various definitions? What specialist technical knowledge is needed and must be demonstrated for particular contributions to be recognized and valued as such in the base disciplines? This is a common problem that confronts any historian of science. How is one to create a two-way street for intellectual commerce between the new discipline and the disciplines from which it borrows? These are not particularly important questions, but they do point up issues of perspective and emphasis that need to be recognized if the historian of information science is to know, at least at the level of intentionality, what he or she is doing?

The issue is two-sided. On the one hand is a body of literature and research of diverse disciplinary origins that can be variously interpreted and appropriated to different uses from those for which it was produced. Here the problem is that such appropriations necessarily decontextualize the borrowed work and what is done with it may be looked at askance or ignored as not legitimate by those from whom the borrowings have been made. They may well want some reassurance about the nature of the collateral, in the form of academic credentials, that the borrower can produce.

On the other hand it is possible to brush aside such sensitivities and take a pragmatic, unselfconscious approach to matters of historical practice and the community of interests and research that supports them. From this point of view the history of information science is simply what those who call themselves historians of information science actually do. Among the range of their activities may well be the appropriation of any aspect of any discipline that seems relevant to their purposes without any concern for recognition from within the discipline. It is important to distinguish this formulation from another that has superficial attractions: that is, the history of information science is the history of what those who call themselves information scientists, or are so designated by others, do. This limits the historian's plough to a field fenced by others. It required him or her to repudiate a fundamental responsibility for identifying topics for research and investigation.

SOME TASKS OF HISTORY

Now it can be said that the disciplinary overlaps, the interpenetrations, the borrowings, the shifting boundaries, the misunderstandings and confusions that arise when we attempt to define information science either as a range of projects for research and investigation (as enumerated above, for example, by Machlup and Mansfield) or more abstractly by attempting to identify the fundamental phenomena in terms of which it is constituted (systems, signals, utterance or text, for example), represent both a splendid opportunity for the historian or a nightmare. Among the opportunities might be: (1) clarifying how these and other relevant research projects came to be constituted; (2) isolating the factors that led, for example to the creation of the contemporary disciplines and interdisciplines that are seen to have a bearing on information science broadly

speaking or that form one or other of the information sciences; (3) examining the incomplete and uneasy processes of ordering that bring them together and determine, however provisionally, their affiliations and the particular interests, orientations and, of course, relationships of their adherents; (4) creating a unifying perspective for otherwise confused or confusing disciplinary relationships by identifying and interpreting intellectual roots, common themes, and developmental trends.

Some of the factors that are important in the constitution of information science and that might become the focus of historical study are intellectual—bodies of theory, interesting concepts and ideas that have migrated from one "interreading population of scientists," to use Newell's striking phrase, to another (Newell, 1983, p. 104). These are what *Studies of Information: Interdisciplinary Messages* (Machlup & Mansfield, 1983) explores in such a comprehensive and original way. Other factors are technical, such as the range of developments that are now referred to as information technology. One contribution of history may be to enlarge our understanding of the technical base of information science as encompassing much more than developments that are centred on the computer (e.g. Chandler, 1962, 1977; Yates, 1989; Beniger, 1986; Campbell-Kelly, 1989), thus suggesting a longer chronological perspective for it than is generally recognized now.

Other factors are social and organizational and these will help explain what is studied and by whom, how this research is supported, where and how it is reported, and the complex interweaving of invention, application and theory, of what is pure and what applied that equally characterizes this as other fields of research activity. An interesting aspect of the social dynamics of the new field of information science in its early years was the emergence and consequences, many of them dysfunctional, of status differentials between those affiliated with core information science disciplines, such as, especially, librarianship or library science and computer science. This phenomenon is adverted to by Rayward (1983b) and Burke (1994, 1996) but has not yet been systematically examined, though Buckland in this issue of *Information Processing & Management* has some interesting things to say about it (Buckland, 1996).

The nightmare for the historian confronting the confusion discussed above is that the opportunities this confusion seems to present may be no more than illusory and he or she may be able to do no more than reproduce it. There is also the possibility that in fact what we have taken to calling "information science" may simply be a staging post intellectually on the way to something else. How are different historical pieces to be fitted together when there is little or no common structure of discussion, argument, or controversy within a community of scholars who acknowledge the existence, and whose work defines, a field of study? Where are the sources, the private papers, the archives that are the historian's stock in trade and the existence of which can determine the nature of a particular historical contribution? Where is the disciplinary infrastructure that knits and binds and orders—publications, indexes, bibliographies, academic departments, conferences and so on? In fact, positive answers to all of these questions is now becoming possible,

AN EMERGING COMMUNITY OF INTEREST IN THE HISTORY OF INFORMATION SCIENCE

Bibliographic dimensions

It is important to acknowledge at this point that the history of information science as a field of study, whether approached from either a library science or a computer science perspective, is now attracting interest and as a result is acquiring the bibliographic and social rudiments of disciplinary identity. From the library science point of view, this interest can be seen to be gathering momentum in the middle 1980s. It is marked, for example, by the Spring 1985 issue of the *Journal of Library History* (Miksa, 1985; Hayes, 1985a, b; Rayward, 1985; Wright, 1985) which grew out of a meeting of the American Library Association's Library History Round

Table in 1984. Other collections of historical papers appeared in the next few years (e.g. Davis & Dain, 1986; Meadows, 1987).

Moreover, in the decade of the 1980s a number of reflections, some more anecdotal than others, on the development of aspects of the field, were published by key early figures (Becker, 1984; Bourne, 1980; Cleverdon, 1987; Gull, 1987; Herner, 1984; Jackson, 1991; Kilgour, 1987; Salton, 1987; Swanson, 1989; West, 1982, Wooster, 1987). These papers are of great importance. They are written, most of them, from the point of view of participants in the experimental systems that the emerging information and communications technology of the 1950s and 1960s made possible. They present for the historian's subsequent and professional evaluation a preliminary identification of leading ideas, assumptions, and technological capability current at that time. They reveal a tracework of personal and institutional affiliations, of complex relationships, aspirations and pressures involving individuals, corporations, the academic community and government that are ripe for further investigation. Their authors suggest possible frameworks for re-evaluation, pointing to what was important as they recall it and what became a dead end as they themselves, in retrospect, reassess the nature and limits of the developments in which they were involved (see especially in this respect Swanson, 1988; Gull, 1987).

But in considering these assessments, the historian needs to compare them with earlier historical or predictive statements, perhaps by the same persons who even then not only looked forward but also back. Saracevic in 1970 reviewed the history of the concept of "relevance" (Saracevic, 1970) while Froehlich takes it forward from 1994 (Froehlich, 1994). Bourne discussed the history of information retrieval in 1963 (Bourne, 1963) while at about the same time Mooers looked forward 20 years in information retrieval development (Mooers, 1961). In 1963 Wooster examined in prospect (Wooster, 1963) what to some degree in 1987 he reflected on in retrospect (Wooster, 1987).

In this issue of *Information Processing & Management* Trudy Ballardo Hahn explores some of the issues related to the development of online searching from the perspective of such pioneers (Hahn, 1996). Buckland, on the other hand, makes a case for what he sees as a striking discontinuity of ideas and influence in the 1930s that he believes had major consequences for subsequent developments in the United States. He is concerned with the possible implications of the Graduate Library School of the Univerity of Chicago, which had been created with much fanfare in 1926 to spearhead a new research-based approach to the study of library problems, apparently not understanding or benefiting from the legacy for modern information science of another group of pioneers, the European documentalists of the pre-war period (Buckland, 1996).

A major conference in 1991 in Finland explored the historical, empirical and theoretical foundations of information science and has had echoes in that several of its papers were published not only in the conference proceedings (Vakkari & Cronin, 1992) but in revised form in the journal literature (e.g. Ellis, 1992; Frohmann, 1992; Rayward, 1994b). There has also been a recent but unscholarly and incomplete attempt at a general monographic history (Lilley & Trice, 1989). An interesting aspect of the emerging bibliographic structure of the field from the library science point of view are the numerous information science related articles in the new *Encyclopedia of Libary History* (1994) and in the *Encyclopedia of Library and Information Science* both in its basic set (1968–1983) and in its supplementary volumes (1983–1995).

At the end of the decade a substantial history of the early years of what became the American Society for Information Science was published (Farkas-Conn, 1990). An English translation of a body of Otlet's papers appeared (Otlet, 1991). Recently, too, Richards (1994) culminated more than a decade of valuable work and contributes an important paper to this issue of *Information Processing & Management* on the extraordinary practices adopted by the post war Soviet Union to acquire Western scientific information (Richards, 1996). A comprehensive, meticulously documented study of an experimental technology that has become almost iconic of pre-computer information technology, the Rapid Selector, appeared (Burke, 1992, 1994). Burke's study of Project INTREX reported in this issue of *Information Processing & Management* is of similar importance (Burke, 1996). Related studies are those of Yates (1989), Beninger (1986), Campbell-Kelly (1989) on the development and organizational consequences of early

information technology. These sorts of study highlight the value and intrinsic interest for the field of rigorously *historical* studies that draw on diverse archival and other sources.

Social dimensions

In the United States the bibliographical dimensions of an emerging field of study so partially and incompletely outlined above, reflect its gradually consolidating social organization. The small community of those interested in the history of information science is generally centred in the American Society for Information Science and the individuals and disciplinary preoccupations that are embraced by this Society. It has sponsored pre-conference sessions on aspects of the history of information science at each of its annual meetings since 1991 (Buckland, 1994) and another is scheduled for 1995. How the history of the field is best included formally in the Society's organizational structure has recently been much discussed and for the moment the Special Interest Group (SIG) on the Foundations of Information Science will represent it, though there has been a push to create its own SIG. The Society is also sponsoring a biographical program related to the field's pioneers (SIG/FIS, 1995).

While there is as yet no separate journal specifically devoted to the history of information science, from time to time mainstream journals in the field publish individual articles or issues devoted to aspects of the subject. It is noteworthy that this issue of *Information Processing & Management* with a small collection of articles on the history and historiography of information science, for example, is to be paralleled by an issue of *JASIS* (the *Journal of the American Society of Information Science*) (Buckland, 1995a). A chapter of *ARIST (Annual Review of Information Science and Technology)* sponsored by the Society is being prepared on the history of information science (Buckland & Liu, 1996). Such a chapter in ARIST will break a silence that has lasted almost 20 years following Shera and Cleveland's ARIST article, "The History and Foundations of Information Science" (Shera & Cleveland, 1977). The lapse of time has been such that now a considerable volume of literature on the history of information science, of the kind referred to above, has appeared. The new ARIST chapter will no doubt survey it systematically and comprehensively. An interesting form of recognition of the maturity, the viability of the history of information science as an emergent field of study will be the extent to which history is included in the regular schedule of ARIST surveys.

Paralleling the studies mentioned above that reflect the emerging bibliographic and social context of information science are others no less important and equally relevant from students of the history of libraries and library science on the one hand and of the history of computer science, data processing and the development of information technology on the other. Of particular importance in the latter area is the journal, the *Annals of the History of Computing* published by the IEEE.

PRESENT/PAST: CONTINUITY/DISCONTINUITY IN THE HISTORY OF INFORMATION SCIENCE

With this discussion of a range of issues as background, we suggest that any historical approach to information science must go beyond pragmatically delineating a field of study as whatever is happening in it, even though there is much happening in the history of information science as we have just indicated. The emphasis of what has been accomplished along the lines indicated above has tended to be on what is within living memory and commonly rubricated as information science. The "Pioneers" biography project of the American Society for Information Science project, for example, reflect this orientation.

It is clear that a new discipline, "information science," now attended by the rather tortured definitional discussions and scope notes briefly canvassed above and generating what might be described as the positivist "angst" expressed by Schrader (1984), began to emerge as field of research and development during and after the Second World War. It is not surprising that a

generation or two later this is exciting historical interest. Our aim, however, is to seek a broad and potentially integrative historical framework for these relatively recent developments that will give them a dimension, a resonance, a depth of perspective not commonly acknowledged.

Let us accept that "information science" is a term that is now conventionally used for attempts within the last 50 years or so to study in a formal and rigorous way processes, techniques, conditions, and effects that are entailed in improving the efficacy of information, variously defined and understood, as deployed and used for a range of purposes related to individual, social and organizational needs.

This description includes but may well go beyond Machlup and Mansfield's "narrow" information science discussed above. It avoids the sterile controversies that have erupted from time to time about what constitutes a science and whether library science or information science are really sciences (Hauser & Schrader, 1978; Bennett, 1988). What we might broadly call the management of information has to do with certain aspects of the personal, social and organizational dimensions of informing and becoming informed (Buckland, 1991b), of finding out, knowing, understanding, deciding, and remembering both at the specific level of the individual and at the more general, metaphoric level of society, government, and the organization. Not all aspects of these activities are involved, of course, for many fall into the arenas of other disciplines.

What nowadays we casually refer to as "management" and "information" are, like "information science," recent constructs. As such, they oblige the historian to understand that there has been a break with the past and that something new has become possible, that a concatenation of novel circumstances and processes, both disciplinary and broadly social, have created conditons for the emergence of new ways of conceptualising aspects of reality and of thinking and speaking about them. To borrow a notion of Foucault, we might say that a discursive formation has occurred which has achieved the threshold of positivity (Foucault, 1972). We implicitly recognize that something like this has happened when we use such expressions, now part of the common linguistic currency, as the "information revolution," "the information society," and "the managerial revolution."

Nevertheless whatever the nature of the discontinuities that further investigation may reveal, we also posit the existence of important continuities no less in need of investigation if for no other reason than to help clarify the nature and extent of the changes that have taken place. As we suggested above, an historical approach can bring a unifying perspective, a new way of negotiating boundaries in so far as such boundaries are thought to be conceptually necessary or necessary from the point of view of disciplinary politics.

THE ULTIMATE FOUNDATION: INFORMATION AND SOCIETY

In our view information science deals with something that is now and ever has been fundamental to human society. Managing information has a long and interesting history to some extent obscured by the circumstances of the different linguistic practices of the past (see Schrader, 1894 for the recent past). It is intimately and intricately bound up with the cultural imperatives, the modes of thought, belief and investigation, the interrelated economic, social, political, administrative, recreational and educational systems that are characteristic of different times and places.

We believe that the historian of information science must understand that as a condition of their organization, reproduction and control, all societies have evolved their own distinctive ways of managing information. He or she must recognize that what constitutes information, what it may be called, and the practices adopted for its representation, communication and use, may change from one historical context to the next, from generation to generation, from one way of thinking about the world to another. It is, however, always necessarily present and in play. It is this notion that guides the approach we wish to take here to the history of information science.

A SUGGESTION OF PERIODICITY—BRAUDEL AND THE ANNALISTS*

Because everything cannot be dealt with at once, historians typically work within a given time frame or period. How historical periods are defined and used may vary with each historian, though individual approaches are usually established within a context of conventional divisions by locality or place (town, country, region) and by time, such as broadly by century (late nineteenth century) or as specifically as a particular year (1914 or 1830) or general periods (industrial revolution) or epoch-marking events (the Thirty Years' War) and personalities and political regimes (the Napoleonic era).

In attempting to dramatise the importance of the idea of periodicity for something as apparently new and contemporary as information science we refer to the ideas of Ferdinand Braudel and the *Annales* school of French historiography (Hexter, 1979). They talk about different historical rhythms and attach different kinds of evidence and narrative to each rhythm. The slowest moving is the *durée longue*, an "almost timeless history," whose passage is almost imperceptible, where events are measured in perhaps thousands of years. This is the context within which we see the emergence and gradual transformation of the basic stages of human civilization. Within it the fundamental, formative structures that constrain and shape human society are imperceptibly modified. It is time measured on a geographical scale within which man interacts with his environment.

Next, in the *durée moyenne*, is change that occurs at a rate of hundreds of years: the rise or fall of empires, for example, or large scale technical change. This is what might be described as "social" time which involves man in relation to groups and groupings. Within its compass are *conjunctures*, cyclic social, economic, and technological movements or rhythms slow enough not generally to be perceptible to those who live through them but profoundly implicated in any attempt to understand historical developments.

Finally, in the *durée courte* comes change that is measured in months or years or decades. This is time measured on a personal scale and its concern is with *evenements*, the rapidly moving circumstances and events of the moment, what Braudel describes and tends to dismiss as "surface disturbances, crests of foam that the tides of history carry on their strong back" (Braudel, 1972, p. 20–1).

In the infinitely receding vista of history, we use the idea of the *longue durée* from our point of view to capture the idea of a vast background that helps to give us the perspective needed to consider the ways in which nature, mankind and society have evolved and achieved an incredible variety of social organizations and structures by means of processes involving information in some fashion or other. It is in the *longue durée* that we see the emergence of Western and other civilizations. Within it takes place the development as part of these civilizations of different cultural traditions constituted within widely varying written and oral communication practices which have in part determined how successfully these civilizations have been able to survive and reproduce themselves as the generations succeed one another. Here archaeologists, paleantologists and historical and cultural anthropologists do their thinking and investigations. For Braudel, it can be a *durée trop longue* to allow effective historical analysis. Here the intrepid historian of information science would investigate what these scholars and scientists do and how they do it and what they have found. This involves the creation of what one might call meta-theory and meta-history, the exploration, as mentioned above, of the explanatory strategies of these and other disciplines.

What is contained in the *long durée* is perhaps of least interest to the modern historian of information science who is now beginning to find his or her conceptual feet. It is too far distant; the nature of the evidence for understanding what has happened in it too difficult to determine; the possibility of gathering adequate and sufficient evidence too remote. Perhaps it is merely fanciful to introduce and characterise the *longue durée* as we have here, but our aim has been to see where the analogy with Braudel's concepts might lead us and to ensure that the distant past is not forgotten. In that far off vista, almost beyond the reach of what is perceptible and determinate, lie the remotest of origins, the play of the most primitive of creative conditions and

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* I owe the suggestion of using Braudel's categories in this context to Geof Bowker.

forces, the very portents and omens of the shape of the material world and the civilisations of mankind that have emerged and changed with the stately passage of the millennia—of information processing! It is *trop longue*.

In the *medium durée* it is easier to understand how we are directly involved; it is closer to home. We begin to see through the development of systematized processes of thinking and investigation, the creation of coherent bodies of knowledge that become the subject of continuous refinement and critical scrutiny—the emergence of disciplines and formal, institutionalized education that depends to some extent on writing and the written record. Also here are developed by Government, the Church and civil society a range of information handling institutions whose functions and purposes may change in often profound ways as they are moulded to their coeval cultures, though looking backwards carelessly or uncritically we may misguidedly characterize these institutions, because they continue to exist, as fundamentally similar to what continues to exist (Hooper-Greenhill, 1992). Here too we have to assess the nature of the epistemes, the different ways of being able to look at and think about the world that Foucault has identified as characterizing the classical period, for example, or the modern period and explore their implications for the concepts and processes that managing information entails (Foucault, 1972).

The *court durée* captures recent developments for historical study and it is here that, naturally, most of the recent interest in the history of information science has been focused. In the *court durée* are the great social upheavals of modern times. Here we locate the invention and rapidly developing technology of the computer and telecommunications and the flourishing intellectual activity surrounding them that has resulted in the creation of new disciplines and the currently ill-defined interdiscipline, information science. Here we find the documentalists of the late nineteenth century and early twentieth century. Here is a new cadre of specialists developing new information handling techniques to exploit the exciting technology emerging during and just after the Second World War. Here are spawned the devices, theories, systems, meetings and discussions, books, papers and conferences that have come and gone in the last 50 years with remorseless speed either leaving little discernible trace behind or, in the market place of things or of ideas, transformed almost beyond recognition. Here we see the foundation of specialised societies and associations to shelter and help focus the work of those concerned with aspects of information and its management.

The *court durée* is history as recent and engrossing as yesterday's television news. For some what flickers on the screen of the *courte durée* is of no interest because so much of it is evanescent and trivial and they repudiate the limitations it imposes on analysis and explanation. For others seeking to understand what seems to be happening or has just happened in the areas that are of interest to them, what they see is vivid, engrossing and suggests lines of investigation and argument. They seek formal evidence as they learn to distrust the accuracy and comprehensiveness of reports from living memory. For these investigators the rich, buzzing activity and confusion of recent developments must be framed for understanding if they are to look beyond these developments to discern more lasting historical phenomena and achieve more general explanations than such developments would seem to allow. What such frames might be, how they are to be arrived at, and what their effects might be constitute an intriguing set of questions.

SYNCHRONIC AND DIACHRONIC APPROACHES TO THE HISTORY OF
INFORMATION SCIENCE

In establishing a framework for "periodicizing" the history of information science we also believe it is helpful to introduce the notions of Synchrony and Dyachrony. These notions we use to express broadly different approaches to historical study. In the phrase "synchronic approach" our intention is to capture the idea of the historian of information science trying to tell the story of a period, however it is defined, in one or many or all of its information manifestations—in Venice (or London or Ballarat or the West Indies) in the 18th or 19th centuries (or during the industrial revolution or the gold rushes) or in the U.S. during the War of Independence or after

the Second World War when, with an emergent technology and new kinds of needs within society, there arises the belief that an information revolution has begun.

Here it is a matter of broad narratives that may well touch selectively on social, organizational, political, technological, religious matters as they bear on the creation, value and use of information artefacts; on reading, speaking and viewing; on education and research; on the press and publishing; on records and record-keeping; on government intelligence gathering; and on government regulation of speech, printing and assembly. Especially important in the conditions of any time and place from the "information" point of view is the nature of, and the functionality inherent in, the existing communications technology. This necessarily constitutes an important part of the characteristic "information infrastructure" and what it enables in any historical period. When there are changes in this technology such developments pose profound explanatory challenges for the historian of information science both in terms of what is cause and what is effect—e.g. the notion of infrastructure inversion that Bowker discusses (Bowker, 1994, 1996).

Research into particular events, developments, characters and achievements may well be considered to fall into this category of historical study. Rayward's account of the 1937 World Congress of Universal Documentation, focused on a very precise moment of time and a particular series of events and the circumstances that surrounded them (Rayward, 1983c) is one example and Burke's important study of INTREX reported below (Burke, 1996), which follows the development of a particular project over the relatively short period of its life, is another. In this category, too, would be placed Bowker's exploration of the International Classification of Diseases as a product of a long, complex historical process of interaction between medical knowledge, government policy, social mores, and the politics of the intergovernmental agency responsible for creating and managing the classification (Bowker, 1996).

The "diachronic approach" refers to the ways in which the historian of information science can examine developments in key idea or issues over longer periods. Where the synchronistic focus may be characterized as broad and the approach synthetical, here the focus is narrow and the approach analytical. There is a potentially endless range of such "ideas" that can be investigated diachronistically: the changing media of record and their impact on social and organizational memory; the changing forms and relationships entailed in evolving communication networks; changing approaches to "encyclopedia" or the systematic organization and presentation of received knowledge; the changing understanding and representation of the interrelationships of language, ideas and things in classification systems; developments in "information" institutions and the technologies and special media in terms of which they are constituted—libraries, museums, archives, records repositories, and the offices of business and government. Into this category fall Rayward's study already cited of the emergence of information science (Rayward, 1983a), his paper on schemes for mobilizing information in documents (Rayward, 1994b) and his examination of the ways in which historically public libraries have defined information and provided access to it (Rayward, 1982).

The idea of relating the *durées* of Braudel to a particular field of study may be more fanciful than useful. Our aim in referring to them here has been to stress the need not merely to grasp the recent past historically, so to speak, as important as this is, but to see beyond it to deeper questions and problems that, reaching further back, will allow more general understanding.

It should also be recognized that the distinction between diachronic and synchronic is by no means hard and fast. It does not matter whether a particular study can be characterized by one or other or even both epithets. No particular historical methodology is encompassed by them either. Our point has been to use all of these notions to dramatize the different approaches that can be taken to conceptualizing the history of information science as field of study and to identifying the possible questions and problems for investigation that are encompassed by it.

THE HISTORY OF INFORMATION SCIENCE AS AN HISTORICAL INTERDISCIPLINE

Given these caveats, it is clear that the approaches to historical study—*longue, moyenne* and *courte durées*, and synchronic and diachronic—outlined above describe a potentially vast

project of study and research. One might regard the identification and understanding of post war developments that have a contemporary culmination in the complex of ideas, practices and research that are gathering around notions such as the information super highway, virtual reality, artificial intelligence, multimedia and hypertext as a sufficient and interesting historical challenge.

Was the Republic of Letters of the late seventeenth century, based as it was on correspondence carried from place to place by travellers and new systems of mails—and sometimes the letters were quickly and crudely printed for wider distribution—a form of internet? To what extent is it useful to think of the cabinets of the world and the memory theatres of sixteenth and seventeenth centuries as approaches to virtual reality? The speculative approaches to language pioneered by Comenius and later by Wilkins and Leibniz were experiments in classification, artificial intelligence and information retrieval. What is the impact of the scroll—whether it is ancient, medieval or modern (as represented in the computer screen)—on the way we think and achieve understanding? Is increasing freedom of communication through computer-based systems beginning to re-introduce into contemporary society a new kind of informality—and perhaps a new kind of illiteracy—that equates with fundamental aspects of the oral tradition?

A history of information science that is conceived as broadly as we have sketched it here, with, as it were, a long tail that can be extended as far back into the past as we care to extend it, is not something new to be undertaken from scratch. Inevitably it will and must draw on already well-established bodies of historical knowledge and the traditions of investigation that underlie them. The history of science and technology, the history of libraries, the French traditions of *Histoire du Livre* that are currently animating major historical projects in Australia, New Zealand, the U.K. and the U.S.A., and the subfields of printing and publishing history and the history of reading are all relevant. Each has its own special concerns and perspectives that can be brought to bear on, and help define, fundamental issues for the history of information science. This suggests that the history of information science may be considered as much a historical interdiscipline as information science itself maybe considered an interdiscipline more generally. The *raison d'être* for a history of information science then becomes not only the illumination from an historical point of view of important disciplinary developments but the new light it can cast on fundamental aspects of human society.

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