Bibliographical foundations of information science: A review essay

SCHOLARONE™
Manuscripts

Bibliographical foundations of information science: A review essay

Abstract

Purpose: The narrow purpose of this article is to review de Fremery's (2024) book about the bibliographic foundations of information science. The broader purpose is to consider the actual as well as the potential relevance of the field(s) of bibliography for information science besides the book under review.

Design/methodology/approach: This review essay examines the arguments put forward by de Fremery's (2024), and introduces concepts and traditional lore from the study of bibliography, and presents internal conflicts or paradigms in the field of bibliography. It relates this information to foundational issues in information science.

Findings: De Fremery's basic ambition of basing information science in bibliography is important, and so is the attempt to consider bibliography in relation to contemporary information technologies such as machine learning and data science. The book under review fails, however, to describe the relations between different positions in bibliography, such as enumerative, analytical, descriptive, critical and historical in relation to information science. It rather tends to make problematic claims, for example, that scientific experiments are based on bibliographical methods, and to describe the relation of bibliography to information science on the basis of such interpretations. Nonetheless, the book is a serious attempt to consider the field of bibliography, and thereby support the focus on documents in information science.

Originality: Information science often suffers because ambiguities in the concept of information. When information science is understood as the study of literature-based answering, much else falls into place. The field of bibliography is a core concept for this understanding and re-orientation of information science, for example, by establishing the core relation between bibliography, information searching and knowledge organization.

Keywords. Bibliography; information science; documentation; paradigms

1. Introduction: Bibliography and information science

This review essay examines de Fremery's (2024) book *Cats, Carpenters, and Accountants*, the core claim of which is implied by its subtitle: *Bibliographical Foundations of Information Science*. This review evaluates de Fremery's arguments put forward for bibliography to serve as a foundational concept for information science. It also goes beyond the book to consider the actual as well as the potential relevance of the different fields of bibliography for information science.

The reader should be reminded that what today is called "information science" was formerly called "documentation." (Library and Information science, LIS, is a merging of library science with information science, cf., Hjørland, 2013, 218; here LIS and information science are considered synonyms). Documentation is closely related to bibliography. The founder of the documentation movement, Paul Otlet, founded *the Institut International de Bibliographie* (IIB) in 1895, and wrote an article about bibliography as a science (Otlet 1990 [1903]), which understood bibliography to be about documents in general, not just about books.[1] He also created (with Henri La Fontaine) the *Universal Decimal Classification* (UDC), originally developed for classifying the cataloging cards in the

Universal Bibliographic Repertory. One of the most important indicators of the relationship between documentation, and information science is the change in name of the *American Documentation Institute* (founded in 1937) in 1968 to the *American Society for Information Science* (today *the Association for Information Science & Technology*, ASIS&T). These facts show the close relations between bibliography, documentation and information science. Kline (2004, 19) also expressed that bibliography is one of the former names of information science.

In library schools, bibliography was often taught as a core subfield, closely related to literature searching. When the name of the discipline changed to information science or LIS, the role of bibliography seemingly became less important, with emphasis shifting towards user studies. This terminological shift in the name of the discipline was even accompanied by some voices claiming "the bibliographical paradigm" to be obsolete (e.g., Henri and Hay 1994), a view critiqued by Hjørland (2007).

This article examines the question raised by Buckland, and referred by de Fremery (2024, p. 1): "What might be gained by reinvigorating bibliography?" It does so by considering the arguments put forward by de Fremery as well as by considering other sources of information.

2. The structure of de Fremery's book

The book under review considers the processes of enumerating (or listing), description, analysis and critique as the core processes in bibliography. It is organized in two parts, with Part I focusing on enumeration and Part II on description, whereas (p. 11) the book "largely forgoes, for example, a discussion of bibliographical analysis and critique, a topic that [the author] take[s] up in a companion volume being prepared independently."

That said, the structure of the book is very difficult to describe. One thing is that it is unsystematic in its argumentation. For example, (1) it does not provide a developed understanding of bibliography as a field of study as the starting point for examining its potentials in relation to information science; (2) it tends to make claims based on analogies, which seem too easy bought, and thereby undermine the argumentation; (3) and it has a tendency to introduce needless digressions rather than provide a progressive argumentation. Examples of these three points are:

- (Re 1) The discussion of the term "bibliography" starts in the introduction. On the very first page, de Fremery writes: "It is a plain word that would seem to suggest little more than a list of books." Rather than discuss and expand of this definition, and address the important question about bibliographical units, the author goes on defining bibliography as the study of representations, without considering how it formerly has been understood in the literature, or if it has to do with certain kinds of representations, or with representations in general. Chapter 1 is titled "A list of keywords." The first keyword in this list is "bibliography," in which we expect and need a presentation of different approaches to bibliography as a field, including its different traditions and their relation to information science. If the author choses to define bibliography as the study of representations (as in the introduction), this should be argued here based on an analysis of previous definitions. However, the keyword "bibliography" in chapter 1 it is almost only about D. F. McKenzie's (1999) *Bibliography and the Sociology of Texts*. We have not yet been informed about McKenzie's theoretical position, and a systematic overview of different fields and traditions in bibliographical studies are absent in this chapter. It is not that these different approaches are ignored in the book, as we shall see in Section 4.

- (Re 2) It is argued that because bibliography uses enumeration and description, this means that the use of enumeration and description can be considered bibliographic procedures. On pp. 4ff, it is claimed that Kurt Gödel's (1931) first incompleteness theorem is based on "the ordinary bibliographical tools of enumeration and description." No, they are not. Bibliographers did not invent enumeration, which is a very general concept used before bibliographers used it, and it should not come as a surprise that information professionals do not have a monopoly on recording and communicating information. Moreover, an enumeration of, for example, some plants, can be based on fundamentally different principles and epistemologies, which de Fremery does not mention, such as, for example, logical division, essential characteristics, overall similarity, and so on. An enumeration of plants, for example, presupposed a definition of species, and today there are conflicting views about what species are, and how they should be identified (cf., Minelli, 2024). The claim that Gödel used enumeration is correct, but that it is based on ordinary bibliographical tools is wrong because bibliography did not, in any way, influence the theoretical elaboration of Gödel's theorem nor has it contributed to other scientific developments of such importance. This example just shows that de Fremery has not been able to specify how bibliography can be distinguished from general scientific procedures. A long section (pp. 4-10) is used to make this claim with different examples.
- (Re 3) In the introduction, following some unsubstantiated claims about the responsibilities of bibliographers, the book drifts into claims about the relation between bibliography and data. Thereafter comes a long section (pp. 4-10) about "Kurt Gödel, Yi Sang, and bibliography's ordinary tools: enumeration and description." It is only at p. 11 that de Fremery presents an outline of the book. Therefore, the introduction contains much material that does not belong here, contributing to making to book difficult to read.

As already said, Chapter 1 is titled "A list of keywords." It contains the following subsections.

Bibliography	Culture
Copying, reproduction, recursion	Affordance
Enumeration, description, analysis, critique	Data, documents, information (again)
Communication and information	Texts
Understanding and defamiliarization	Information science
Hypothesizing	Books
Science, technology, art	Kinds of power
Technical and boundary objects	

This way of writing a book is not a good idea. A book should make a coherent argument in which the terms are introduced in a logical order, not start with a list that resembles disjointed encyclopedia entries. Moreover, the selected "keywords" seems somewhat arbitrary, and in addition concepts are discussed under more headlines without internal references. The term "text", for example, is both used as the label for an independent keyword and also discussed under "bibliography". One never gets the feeling that the terms have been properly introduced, but rather accompanied by the author's free associations. The chapter therefore reads more like a set of unrelated ideas than as part of a coherent argumentation.

Because of this lack of a proper introduction to the field of bibliography, I provide my own overview in Section 3 as a background to discuss de Fremery's arguments in Section 4 and 6. I hope that this presentation of bibliographical traditions will also be valuable in itself.

3. The fields of bibliographical studies

The term "bibliography" is used both about one or more fields of study and about a kind of document (how a bibliography is defined varies among researchers in bibliography). About the overall development of bibliographical studies, Foot (2006) wrote:

> "From an original (nineteenth century) emphasis on enumerative bibliography, the concept of 'Bibliography' widened out (from the end of the nineteenth century) to include historical bibliography and the study of books as material objects; in the mid-twentieth century this wider approach narrowed down, as a consequence of much emphasis being placed on descriptive, analytical, critical and textual bibliography. Under influence of French book historians the emphasis has changed again and the value of a wider historical approach and greater inclusivity in subjects has brought the study of historical bibliography and that of the history of the book much closer together'.

This quote lists some concepts that are commonly used in relation to bibliography (but without consensus about their meanings.) Bowers (1952) made the following classification of bibliographical studies: (1) enumerative or compilative bibliography; (2) historical bibliography; (3) analytical bibliography; (4) descriptive bibliography, and (5) critical or textual bibliography.

Here we shall briefly introduce these concepts in this order: analytical, descriptive, critical and textual bibliography, historical bibliography with the history of the book and, finally, enumerative bibliography sometimes called "systematic bibliography". It is outside the scope of this article to provide a detailed presentation of the debates concerning these concepts.

3.1 Analytical bibliography
Reimer (2015) described this approach as follows:

> "Analytical bibliography studies the processes of making books, especially the material modes of production, including the practices of scriptorium or printing shop. One of the purposes of analytical bibliography is to understand how the processes of material production affect the nature and state of the text preserved in the book."

A main representative is Philip Gaskell's (1974) *A New Introduction to Bibliography*. This book covers hand-printed and machine-printed books through the ages.

3.2 Descriptive bibliography
Descriptive bibliography emphasizes details about page layout, typefaces, bindings, and other elements that help identify a book's edition. Probably the main representative of this field is Fredson Bowers' (1949) book *Principles of bibliographical description*. Reimer (2015) characterized it as follows:

> "Descriptive bibliography involves describing books in a standard form, including technical descriptions of the format and make-up of the book; this is especially important for manuscripts and early printed books, where each physical copy of a book is likely to be a unique version of the text. Descriptive bibliography is obviously a product of and also a contributor to analytical study, having to do with efficient and standard ways to communicate the results of analysis."

Because "each physical copy of a book is likely to be a unique version of the text," descriptive bibliography in the tradition of Greg (1930) and Bowers (1949) aimed at describing an ideal copy of a book, which is a description of the book in its most complete and perfected state that the publisher intended to publish. An ideal copy enables one to test all actual copies in the minutest details for sequence and completeness. As said by de Fremery (p. 184) the descriptions "created by Bowers and Greg made it possible to know that the Hamlet discussed by scholar A is the same Hamlet discussed by scholar B." The Greg-Bower tradition was termed "pure bibliography" by McKenzie (1999, 66). An example of a shorthand descriptive notation of the 1664 edition of John Evelyn's *Sylva* as preferred by Bowers could look this way (from de Fremery 2024, p. 166):

$$A - R^4 \chi^2 \; ; \; ^2 A^2 \; B - C^4 \; \chi I \; D - E^4 \; F^4 \; (F_2 + \chi I) \; G^4 \; H^4 \; (-H_I) \; I - L^4 \; 2\chi I \; ^{38}$$

However, when one turns to electronic documents, each copy is *not* likely to be a unique version of the text. Two electronic copies of the same text can be considered entirely the same because each bit is checked in the copying process, and the probability that two copies are not exactly similar is extremely small. Therefore, it is far more correct to say that copy A and copy B are similar than to say that they are different. However, the same file does not interact in the same way with different versions of the software used to display it. This fact is an issue to consider in relation to digital documents related to the issues of traditional descriptive bibliography. (However, as Gants 2010, 126 pointed out "those able to discern such traces are 'more likely to be found in your university's computer center than in any academic department").

Descriptive bibliographers have generally not been interested in issues such as cataloging in libraries. Library cataloging has developed pragmatic criteria for when to consider works to be "the same" (see Smiraglia 2019, 315, figure 1). See also Tanselle (1977) and Yee (2007) concerning the relations between descriptive bibliography and library cataloging. Neither bibliographers nor information scientists seems to have done research on the ways of referencing in academic books and journals, such as ISO 690, the "Harvard system", the "APA-style, the "Chicago style", the "MLA Style", and the "Vancouver system" or in electronic referencing systems such as "EndNote," "Zotero," "Reference Manager," "RefWorks", and "ProCite."

It must also be emphasized that "descriptive bibliography" is not about the description of contents of publications, such as done, for example, by "abstracting journals" (e.g., Chemical Abstracts, MEDLINE, and PsycINFO). Such abstracting journals is a part of the field known as "enumerative bibliography/systematic bibliography" although these terms are not normally used about such publications.

The philosophy behind descriptive bibliography is, according to Hjørland (2023b, 1539), sometimes characterized by "The idea of complete descriptions of documents," which also has influenced library cataloging philosophy (ibid. 1537-39). Gaskell (1974, 322), however, clearly advocated functional descriptions.

3.3 Critical and textual bibliography
The term "critical bibliography" is used about the scholarly practice that combines elements of analytical bibliography with historical and textual criticism (although Greg 1913 used this term as opposed to "systematic bibliography"). Its aim is to study the physical aspects of book production and textual transmission to uncover the relationships between the production of texts and their meanings. This approach typically involves examining the choices made during the printing and

publishing process, and their influence on the interpretation of a text. This traditional meaning is not related to critical theory (as opposed to the bibliographer McKenzie, 1999). The term "pure bibliography" therefore seems a better choice, although "critical bibliography" is related to processes such as textual criticism and the preparation of "critical editions."

Krummel (2017, 478) defined textual bibliography thus:

> "Textual bibliography is a search for authenticity of literary works based on a probing of the printed evidence. Its roots are in classical philology, Biblical studies, and modern editorial practice. Its calls on the practices of analytical bibliography to authors whose writings exist in variant printed editions, often in the absence of manuscript sources. Locating the crucial evidence requires a thorough familiarity with the text, a close reading of many copies in search of variants, and a knowledge of printing house practices, as well as an understanding of the authors and their working relationships with their printers, editors, and publishers. Contrary to what one might suspect, there are important differences in the texts not only of earlier authors of the "hand press era" (before about 1830) but also of many twentieth century authors as well."

Reimer (2015) defined it as follows:

> "Textual bibliography attempts to establish the "state" of a text, especially in terms of the various versions that are extant, and analyzing who (author, editor, compositor, printer, etc.) was responsible for particular variants. Textual bibliography is obviously part of the process of preparing a scholarly edition of a text, though its significance is certainly not limited to editors."

Textual bibliography is used to produce "critical editions," which are attempts to construct a text of a work using all the available evidence. Prominent examples are studies of the Bible, of Shakespeare and other "Great Books" in different cultures. Such bibliographical studies have often been extremely important for subsequent researchers. The *Marx-Engels-Gesamtausgabe* (MEGA) is another example, which in important ways has led to a new interpretation of the works of Karl Marx (cf., Bellofiore and Fineschi 2009).

Among the influential works in this field is G. Thomas Tanselle (1990), *Textual Criticism and Scholarly Editing*.

3.4 Historical bibliography and the history of the book

Bowers (1952, 190) defined historical bibliography as:

> "Enquiries into the evolution of printing (including type founding and paper-making), binding, book ownership, and book selling."
> Further (190-1):
> "It is difficult to limit this grouping narrowly, but let us say very much in general that it concerns itself chiefly with the discovery and interpretation of external evidence."

However, Bowers (1971, 33) provided a different classification of the varieties of bibliographical activity in which "historical bibliography" was omitted and the order of the remaining four are "enumerative, descriptive, analytical, and textual." Harris (2004) commented: "What should be noted is Bowers' evident inability to find a satisfactory definition of what he had previously called 'Historical bibliography'." We shall not dig deeper into this issue here, but content ourselves with noting the relation to book history, which was acknowledged as an interdisciplinary field in the 1980s and in which bibliography is one of the ancestors. Book history distinguish itself from fields such as the history of ideas, the history of science and the history of literature by considering the book as an object, not just the text or ideas contained within it. Krummel (2017, 479) found that if there are differences between historical bibliography and the new fields of study called "print culture" and "book history," they are subtle and often irrelevant.

Among the pioneers in the history of the book is Robert Darnton, who wrote an article (2007) about the field, in which he addressed the tendency to fragmentation and emphasized three main questions for the field to consider (p. 495): "How do books come into being? How do they reach readers? What do readers make of them?"

Historical bibliography examines the history of the book as a cultural artifact. It explores how books and other documents have influenced and been influenced by historical contexts, including how they reflect and affect social, cultural, and intellectual movements. It includes the evolution of book production and dissemination over time as well as the history of reading practices.

Another influential researcher is Donald Francis McKenzie, about whom Greetham (1994, 338-9) wrote:

> McKenzie has moved the center of historical bibliography away from the book narrowly conceived (and particularly the book of 'literature') towards a consideration of all forms of communication in a society. [...] This widening is also shown in plans for the final volume of the series [Nash, Squires, and Willison 2019], where McKenzie's collaborator Ian Willison includes such 'non-book' media as television scripts, film scripts (and associated records of film production) in his definition of the book."

McKenzie critiqued the traditional focus of bibliography on establishing authoritative texts ("ideal copy"), advocating instead for a recognition of the multiple forms and versions of texts as they are influenced by various agents and processes over time. He contrasted two conceptions of "text" (1999, 55): "One is the text as authorially sanctioned, contained, and historically definable. The other is the text as always incomplete, and therefore open, unstable, subject to a perpetual re-making by its readers, performers, or audience." The chapter writing this is called "The dialectics of bibliography now," indicating McKenzie's use of both conceptions, focusing on both how texts are intended by their authors and on how they are received and interpreted by readers. He advocates for a view of bibliography that not only acknowledges the technical and physical aspects of texts but also fully embraces their social and cultural dimensions. [2]

"Historical bibliography" (with "print culture," "book history," etc.) is thus a field of study that is much broader than analytical, descriptive, and textual bibliography as described above.

3.5. Enumerative bibliography/"systematic bibliography"/"reference bibliography".
The terms "systematic bibliography," "enumerative bibliography," and "reference bibliography" [3] are used as synonyms in the present article. Reimer (2015) defined it so:

> "Enumerative bibliography lists documents, produces catalogues and bibliographies and similar research tools, 'enumerating' [or listing] different categories of texts."

Although Reimer does not mention huge bibliographical databases such as MEDLINE, Web of Science and WorldCat, they are of course essential bibliographic tools for researchers, although sometimes excluded from this concept. [4]

Besterman (1940, 1) wrote:

> "Bibliography falls into two distinct and well-recognized classes: the enumeration and classification of books, and the comparative and historical study of their make-up. The former of these two divisions has been happily named 'systematic bibliography' by Dr. Greg [1913], as contrasted with the second class, which he named 'critical bibliography'."

In a footnote, Besterman found Greg's distinction "true and necessary," and regretted that it has not been more influential and that Greg later stigmatized systematic bibliography as "mere prostitution" of the true science of bibliography,[5] and characterized its practitioners as drudges who are in danger of becoming a "race of Robots." Greg thus refused to accord to this drudge the title of bibliographer, a title that he reserved for practitioners of critical bibliography. In his latest writings, Greg ignored systematic bibliography altogether.

The compilation of subject bibliographies requires subject knowledge, as Greg (1930, p. 259) wrote:

> "There can be no question whatever that bibliographies should be compiled, after mastering the necessary bibliographical technique, by experts in the subjects of which they treat, and not by bibliographers at the dictation of experts."

This indicates that subject bibliography (also called "special bibliography) is not as much a profession in itself compared to analytical, descriptive, textual, and historical bibliography. This is probably the main reason for Greg's stigmatization and exclusion of systematic bibliography. (From the perspective of information science, subject bibliography with bibliographical databases, citation indexes etc. is the most important field of bibliography).

In contrast to what Greg's (1913) termed "critical bibliography", not much theoretical literature exists about systematic bibliography, just as it is difficult to mention names of leading researchers in this field (as compared to Bowers, Darnton, Gaskell, Greg, and McKenzie). Hale (1970) and Schneider ([1926], 1934), are partly exceptions to this rule, although their theory seems narrow. Schneider (p. 4) wrote:

> "There are no bibliographically independent publications dealing solely and exhaustively with the theory of bibliography in its narrower sense: the preparation of lists of books."

Books such as Robinson (1979) [6] and Staveley (1962)[7] are not theoretical works that can define the field as a research discipline. Theodore Besterman (1940)[8] comes closer by providing original historical knowledge about the beginnings of systematic bibliography, but does not provide a theoretical frame for the field. Besterman is among the most prominent persons in systematic bibliography, but he is more a compiler than he is a theorist.

Therefore, although the literature of enumerative bibliography is comprehensive, it mostly consists of lists of bibliographies and practical manual on how to make bibliographies, sometimes including arguments about their optimal design (e.g., Krummel 1986). Theory relevant for enumerative bibliography must be found outside the field of bibliography, namely in the field of information science with the subfield knowledge organization.[9] Examples are Shera (1951, 1961), Briet ([1951] 2006), Wilson (1968), Bates (1976), Garfield (1980), and Buckland (2018).

Shera (1961, 769) wrote:

> "The manner in which knowledge has developed and has been augmented has long been a subject of study, but the ways in which knowledge is coordinated, integrated, and put to work is, as yet, an almost unrecognized field for investigation."

Balsamo (1990, 3) added to this quote:

> "Bibliography has exactly this task: to coordinate knowledge and put it to use in a certain way, by making books known and promoting their dissemination."

Briet and Buckland have set forth a broad understanding of the concept document and a semiotic perspective for the understanding of bibliography. Wilson and Bates have linked the purpose of bibliography with the goal of bibliographic control that endeavors to make it possible for users to identify the documents needed to carry out a certain task.

The relations between "systematic bibliography," "systematic literature searching," and "systematic reviews," connect enumerative bibliography to information science. Garfield contributed to this connection by developing citation indexes and fostering the development of the field of bibliometrics, which leads to a deeper understanding of bibliography. We can thus highlight the following relations between enumerative bibliography and information science:

a) the lack of recognition of enumerative bibliography within other bibliographical studies and

b) the strong connection between enumerative bibliography and information science, as also indicated by Frank (1978).

A domain in which systematic literature searching and thereby enumerative bibliographies and bibliographical control are taken most seriously is evidence-based medicine, where knowledge of the most important findings is of utmost importance. Much research is carried out about databases coverage of relevant findings, about retrieval strategies, and so on. Such research, about the bibliographical coverage and findability of documents relative to a research paradigm is a core issue for a theoretical research in enumerative bibliography as well as in information science.

3.6 Inherent conflicts in the study of bibliography

What Greg (1913) called "critical bibliography" as opposed to "systematic bibliography," is probably the most basic conflict in the field of bibliography, and we have seen that Greg in his later writings did not consider systematic bibliography as part of the science of bibliography. McKenzie joined this view, but both authors acknowledge the importance of enumerative bibliography as a separate activity. As argued above, enumerative bibliography is of core interest to the field of information

science with knowledge organization, and its theoretical issues are connected to this field, rather than with "critical bibliography".

The other fields of bibliography are also of interest for LIS. It is obvious that libraries with collections of old and rare books have an interest in analytical and textual bibliography in order to identify the versions of the books, and in order to support scholarly research related to them. However, this perspective cannot be generalized to common documents as they appear in typical scientific communication. It would be an economical paradox to hire specialists to do research about the documents produced by average or mediocre researchers. Documents must be worth such careful studies (although, of course, nobody can be certain which documents are, and which are not of sufficient value). As with the example of two scholars discussing *Hamlet*, ordinary researchers need to know if the text they read and cite is the same as another author has cited. Here the burden is on the publishers, reviewers, and authors to ensure this identity. It is a sign of bad scholarship if the edition or version of a document is not made explicit and precise, for example, when articles are reproduced in edited books.

Information science also has interest in historical bibliography, the history of the book and the sociology of texts, especially as this relates to scientific and scholarly communication and the roles different kinds of documents play in domains, between domains, and in relation between science and the broader society. Examples include Bazerman (1988) about the genre and activity of the experimental article in science, Kronick (1962) on the history of scientific and technical periodicals and Lindsey (1978) criticizing leading professional journals in psychology, sociology and social work. This part of research is, however, very broad and lacks coherence, but is very important in order to obtain a deeper understanding of the fundamental issues in information science.

Various theoretical conflicts exist within "critical bibliography" as well as within "enumerative bibliography." In "critical bibliography," McKenzie's sociological approach challenges the assumption held by Greg, Bowers and others [10] about the "ideal copy" and about the most fruitful epistemological approach to follow. In enumerative bibliography, the conflicts should correspond to different schools in information science as described by Hjørland (2018$_{a+b}$). In both cases, the conflict between an individualistic and a social epistemology (SE) seems to be the most fundamental one (cf. Hjørland 2024).

4.   de Fremery's presentation of the fields of bibliography

Chapter 2 starts with a list of "bibliography's many names," providing 84 terms, which are claimed to be just a few of the many different names for bibliography (the list is not shown in this article due to space limits). The rationale for it is not found together within the list in chapter 2, but partly in the introduction (p. 12).

Some of the 84 terms on the list are 'informatics', 'languages,' 'software studies,' 'platform studies,' 'computer games,' 'sociology,' 'linguistics,' 'cybernetics,' and 'economics,' which, among many other terms, are very strange synonyms for bibliography (understood as a field of study, not as a kind of documents). Rather than starting with such a list as if it were an established fact, the author should have developed arguments why he considers each of these terms to be "names for bibliography."

Although the list includes many strange terms, it also is missing many more obvious terms, in particular terms related to kinds of documents, for example,

• author bibliography	• citation index	• documentography
• catalog	• directory	• exhibition catalog

- filmography
- finding aid
- index
- inventory
- list

- manuscript catalog
- national bibliography
- opus list
- registry
- selected bibliography

- stock list
- teleography
- trade catalog

Such terms are important in order to discuss the scope of the concept "bibliography." What are bibliographical units? (Does it, for example, include films, archival records, museum objects, and manuscripts? Does it include all kinds of documents in the broadest sense, such as Buckland's (2024) term "documentography" suggests? Would this include tree stubs? (cf., Buckland 1991, 356), landscapes? (cf., Grenersen, Kemi and Nilsen 2016), or the cries of babies? (cf., Lund 2024, xxv). The terms are also important in order to understand important differences among bibliographies. Citation indexes, for example, are special kinds of bibliographies that utilize reference lists in documents, allowing users to trace both cited documents and citing documents, and trace intellectual influences among documents. Finally, the terms listed above can also reveal other characteristics. De Fremery (2024, 2) wrote:

> "Bibliographers are responsible for assessing and safeguarding what has arrived in the present and for reproducing what has been deemed worthy to be made available elsewhere—the data of science, the expressions of culture, and the records of personal witness."

Is this statement true? Or rather, for which kinds of bibliographies is this true? National bibliographies, for example, are normally based on formal criteria such as legal deposit, not on assessments of literary or scientific quality (a task, which is left to the publishers). The statement is most appropriate in relation to selected bibliographies, but these seems to play no role at all in the theoretical literature about bibliography discussed by de Fremery. The point here is that by looking into concrete kinds of bibliographies, one might get a truer picture of what they are and what they do.

Concerning the fields of bibliography presented in Section 3, their presentations are scattered in de Fremery (2024). If we look at the index in this book, the following kinds of bibliography are listed:

- analytical bibliography,
- critical bibliography,
- descriptive bibliography,
- enumerative bibliography,
- historical bibliography,
- new bibliography,

- social bibliography,
- subject bibliography,
- systematic bibliography,
- technical bibliography,
- textual bibliography,
- universal bibliography

Some of these terms are more than just mentioned in the book. This is in particular the case with analytical bibliography and descriptive bibliography in the tradition of Greg and Bowers ("pure bibliography" or "new bibliography") on the one hand, and McKenzie's sociological bibliography on the other hand. These traditions are covered in some detail.

De Fremery does not consider the important differentiation between these approaches and the enumerative/systematic approaches. Although the term "enumerative bibliography" is mentioned in many places in the book (and in the index), it is never properly discussed as one among other subfields. This is also surprising since Part I of the book focuses on enumeration. De Fremery

presents the views of different bibliographers towards enumerative bibliography, and argues that all bibliography is enumerative. However, he never considers the relations between enumerative bibliography and information science (or any other specific bibliographical tradition for that sake). Therefore the very different roles between what Greg (1913) called "critical bibliography" as opposed to "systematic bibliography," which, according to Section 3.6, have very different implications in relation to information science is missed by de Fremery. One of the main purposes of his book was to provide an answer to Buckland's question "What might be gained by reinvigorating bibliography?" This raises the question whether the bibliographers presented in the book have formerly played a role in information science, or whether the connection between bibliography and information science is limited to the field of enumerative bibliography? This is not discussed, and the literature on information science is, in general, not properly considered. An example of what has been neglected is how document description and representation have been discussed in information science (cf., Hjørland, 2023b).

The book introduces the new bibliographers and McKenzie's view on bibliography at considerable length. However, it is not always clear how some of this material contributes to the overall arguments in the book (although much of it clearly does). Chapter 7 is about biological metaphors in bibliographical studies. One example (de Fremery, p. 134) is:

> "As just one example of how the biological thinking of the late nineteenth and early twentieth centuries still supports descriptive bibliographical processes in information science, we can look at the Library of Congress in the US, its subject headings, and how they are taught."

Referring to an example of the genus-species relation, he wrote (p. 135):

> "Food is a parent of Frozen foods; and Frozen foods is the child of Food. There is a kind of poetry in the expression 'logically Food must display that it has a child.' It makes me worry about the progeny of the pizza I had for lunch, but the important point to make by highlighting the poetry to be found in Library of Congress training manuals is that the logic of descriptive systems are themselves run through with assumed equivalences that can be very difficult to see and account for."

The study of hierarchical relationships has been prominent in disciplines like logic, mathematics, and philosophy for centuries. However, the special name "parent-child relation" about generic relations became prominent with the development of computer science (i.e., much later than the period mentioned by de Fremery.) Therefore, this metaphor did not come from bibliography, but it was imported into LIS. It is now widely used interdisciplinarily and therefore does not characterize a tendency in bibliography to use biological metaphors, just as de Fremery's worry whether he had somebody's child for lunch does not contribute to the arguments. This example is therefore a poor choice.

de Fremery provides better examples on how bibliographers have used biological metaphors and compared the development of books with the development of biological species. One senses that the exposure of these biological metaphors is intended as a critique, but precisely why they are problematic is not clear (after all, they introduces a historical perspective to the field). De Fremery admits (p. 14) that these analyses "cannot provide prescriptive recommendations for how to create descriptions." Then, however, they seems to be of little interest in order to answer the question: "What might be gained by reinvigorating bibliography?"

Often, when de Fremery discusses bibliography, he tends to make hasty generalizations and analogies in line with the one presented in Section 2, that Kurt Gödel's (1931) first incompleteness theorem is based on "the ordinary bibliographical tools of enumeration and description." He never suggests what the units of bibliographical studies are, although there are indications that he understands them as "data." Another issue is that although bibliography is understood (p. 29) as "a foundational infrastructure," it is never concretized. There is no discussion of, for example, national bibliographies, bibliographical subject databases, Google or Google Scholar as examples of such infrastructures or of bibliographical control (compare Hjørland 2023a).

However, in spite of such problems in the book, there is no doubt that de Fremery has made a serious attempt to describe the field of bibliographical studies in order to bring its importance in focus for information scientists.

5. de Fremery's use of epistemology

The book has no developed discussion of epistemology and the philosophy of science, although epistemological arguments (in particular in relation to "inductivism") play a very central role. The book's primary source for epistemological arguments is McKenzie (1969), and de Fremery (pp. 170ff) describes the philosophical assumptions held by "the new bibliographers" as inductivism and enumeration and bases his criticism of inductivism on McKenzie. However, neither McKenzie's or de Fremery's epistemological positions are well informed by the contemporary philosophical literature and are not properly developed. What the new bibliographers did was to study historical development in printing presses, typography, paper, etc. Such knowledge is used to determine the age and edition history of books (in the wide sense), based on their physical characteristics, and how single copies may have been corrupted by various processes. This cannot to me just be reduced to enumeration and induction, as de Fremery suggests.

McKenzie suggests supplement inductivism with deductivism and "embrace[ing] 'multiple probabilities' as 'hypotheses' when considering how texts came to be and have been transmitted." All this represents individualist views on epistemology, which today are challenged by social epistemology and historical epistemology in the wake of Thomas Kuhn (1962) (see Hjørland 2024).

Kuhn and social epistemology are not mentioned in the book, but there are some indications that de Fremery has instincts and intuitions that have similarities with this epistemology. This is expressed in his view of data as "what can be taken as given." Although not crystal-clear, it can be read as the recognizing that data have been taken as given by somebody, implicating that they may not be considered as given by somebody else, implying a social and historical perspective on data. SE is also implicit in this quote (p. 133):

> "How do we understand the marginal, 'ambiguous territories' where literary and user warrant intersect with race, gender, and the ideological biases of projected worldviews to create descriptive infrastructures that endure not necessarily because they are productive, fair, or desired, but because they slip from view as infrastructure and become taken as given."

This quote states that bibliographic infrastructures may not serve the interest of users, but just reflect certain ideologies and worldviews, which have been taken as given.

As said, this book focus of enumeration (listing) and description. However, different approaches to enumeration have not been considered. The same is the case for description, where the book does

not distinguish description from other forms of predication, and does not discuss how ideals of description are embedded in epistemological views (cf., Hjørland 2023b).

In the last part of the book, this view s applied to contemporary information and data science technologies such as ontologies, data graphs, machine learning (ML), representational learning, and deep learning. De Fremery's overall way of arguing about bibliographical approaches seems important and very much in accordance with my own way of thinking. Shortly explained, the book considers the epistemological criticism mentioned above, and draw analogies between philosophical assumptions in the new bibliographers' approach and philosophical approaches used in contemporary data science, attempting to illuminate how the philosophical approaches used by McKenzie (and now also Pearl and McKenzie 2018) might improve information and data science. De Fremery suggests (p. 15):

> "that the critiques of bibliographical description as an inductive science leveled by bibliographers such as D. F. McKenzie provide a useful framework for a critique of current ML [machine learning] methods."

The overall structure of the argument is, as noted above, fine. However, the concrete way in which the argument unfolds is less effective. De Fremery (p. 18) writes:

> "As many have shown, the inductive guesses produced by ML, as powerful as they might be, can be powerfully wrong and profoundly exploitative. The chapter [i.e., Chapter 12] concludes with a description of creative, counterfactual imagining as a means of assessing, critiquing, and, we might hope, more equitably wielding the exploitative powers of bibliographical description in its newer technological forms."

However, Chapter 11 outlined some principles of ML (with "representation learning" and "deep learning"). One example is how an algorithm can learn that a picture of a cat can be associated with the word "cat" (i.e., recognizing cats in pictures). However, there is nothing in the arguments from inductivism toward more inclusive or social epistemologies that may have potentials to outperform the described forms of ML in relation to this problem. Therefore, the book does not succeed in its attempt to demonstrate that an alternative epistemology (disguised in the book as McKenzie's alternative to "new bibliography") might provide better solutions. (For other examples on how epistemology is important for information science, see Hjørland 2021).

6. Conclusion

Section 3.6 outlined how different traditions of bibliographical studies relate to information science. De Fremery did not present a similar view. The real surprising conclusion here is that de Fremery's book is not about the relations between bibliography and information science. Rather it is about some epistemological issues, which the book identifies in bibliographical studies and find important for contemporary information technology. The book does not properly base these epistemological views in philosophy, but they can be interpreted as aiming at a foundation for information science in social epistemology and critical philosophy, philosophies in line with my own view. Such an understanding is extremely important if information science is to prosper as a field of study.

De Fremery's book is diffuse, messy, and full of problematic interpretations, such as the claim (p. 50) that scientific experiments are "bibliographical procedures." Such claims do nothing to illuminate

the relations between bibliography and information science, but only establish relations between information science and the author's epistemological interpretations of bibliography, as enumeration, inductivism and their alternatives. As an example of problematic issues, throughout the book, references to the philosopher John Dewey are provided. The index says "Dewey, John (1859–1952), 13, 87, 88, 222." However, in all these pages obviously the library pioneer Melvil Dewey (1851–1931) is meant. For example (p. 87):

> "With the possible exception of John Dewey, it is difficult to think of a historical person more enthralled by the dance that books suggest than the Belgian librarian and systematizer Paul Otlet. He reveled in the infinities of books. To cope with their abundance, he, like Dewey, fashioned enumerative practices that would enable him to assign a number to every document considered significant."

There are no bibliographical references to either Melvil or John Dewey (which is probably the main reason for the confusion.) The first part of the quote "a historical person more enthralled by the dance that books suggests," is unclear. What is it that de Fremery want to say by this sentence? (The metaphor "dance" is used in many places in the book, but what does it accomplish?). The second part of the quote (about signing numbers to documents) is only true about Melvil Dewey, demonstrating the confusion of two different persons named Dewey. The same is the case on the other pages referring to John Dewey.

Despite its shortcomings, de Fremery's book provides a rather comprehensive presentation of bibliographical studies and is, after all, the most important attempt to link information science with the field of bibliography published for many years. Interest in bibliography is an important part of the increasing realization in information science that "document," rather than "information" is the most fruitful point of departure for the field. As White (2017, 3927) wrote: "When IS [information science] is defined as the study of literature-based answering, much else falls into place." Moreover, de Fremery's underlying philosophy, although not properly developed, seems based on sound intuitions.

All in all, then, de Fremery seems to be an uncommonly bold and promising researcher with the praiseworthy aspiration of developing solid theoretical foundations for information science; however, the book reviewed here does not provide properly developed arguments for the thesis that it wishes to prove.

Acknowledgements

Endnotes

[1] Otlet's (1990) view of bibliography is probably best characterized by considering it in relation to "Organization of Knowledge" (p. 75), and to scientific and scholarly communication. He wrote (p. 86): "The Science of Bibliography can be defined as that science whose object of study is all the questions common to different kinds of documents: production, physical manufacture, distribution, inventory, statistics, preservation, and use of bibliographical documents; that is to say, everything which deals with editing, printing, publishing, book selling, bibliography, and library economy. The scope of this science extends to all written or illustrated documents which are similar in nature to books: printed or manuscript literary works, books, brochures, journal articles, news reports, original or reproductions of drawings, and photographs of real objects."

[2] McKenzie (1999) is therefore credited for introducing the sociological perspective into bibliography, but it should be said that library and information scientists Egan and Shera (1952, 131, italics in original) suggested a sociological field, "social epistemology," (SE) as a "parent discipline" for the study of bibliography.

[3] The term reference bibliography is used by Tanselle (1974, 57): "During much of the nineteenth century 'bibliography' was understood to mean what we would now regard as 'reference bibliography'[7] (or "enumerative bibliography")- that is, it was concerned with the intellectual content of books, with preparing lists of books on particular subjects, with the classification of knowledge and the arrangement of libraries." Footnote 7 referred to Hibberd (1965) as the origin of the concept.

[4] Bowers (1949, 18), for example, did not consider worthy of the name bibliography any such publications. Krummel (1988, 243), however did so: "Online services provide for an infinitely more convenient consultation, for which they are enthusiastically to be welcomed. But consulting is only one of the two functions of a bibliography. By its nature the printed text is the medium of deliberate reading." Finally, Balsamo (1990, 6), distinguished bibliographies and bibliographic databases, writing: "In the twentieth century, bibliography entered a critical period because of the difficulty of keeping up with the exponential increase in production and because of the appearance of other media than books and journals. This does not mean that bibliography no longer plays an important role, especially at the specialist level, where it is complemented by other tools such as *indexes* and *abstracts*. These forms arose out of bibliography and are now growing." Two comments: (1) Indexes and abstract journals/databases are kinds of enumerative bibliographies, I have seen no argument why they should be excluded; Abstract journals are a kind of annotated bibliography; (2) Abstract journals did not grow out of bibliographies as Balsamo claimed, but initially abstracts were collected in the bibliographic sections of primary journals (cf., Manzer 1977).

[5] Greg (1930, 258-9): "I am therefore bold to claim for bibliography the title of a science, and believe that as a method of discovery it is thoroughly scientific. It rests with us who use it to make it an efficient, as it is certainly a legitimate, instrument of historical investigation. Upon this, as I conceive it, rests the future of bibliography and its claim to serious consideration, a consideration that is already being in some measure accorded it [...] But there is a danger which, while I do not think it very serious, had best not be lost from view. There is one service which may be asked of bibliography, or at least of bibliographers, and is indeed all too readily asked of them, which it is no part of their business to perform. It is that bibliography should become the slave of other sciences, charged with the compilation of ' bibliographies '. This is mere prostitution. [...] I have no quarrel with bibliographies or their compilers, nor do I deny the need for some bibliographical knowledge both in ascertaining the characteristics of books enumerated and in presenting the information when acquired ; but there can be no question whatever that bibliographies should be compiled, after mastering the necessary bibliographical technique, by experts in the subjects of which they treat, and not by bibliographers at the dictation of the experts."

[6] Robinson (1979) contains five chapters: (1) The meaning of bibliography and its varied forms, (2) The collection of material and the mechanics of compilation, (3) Arrangement, (4) Layout, and (5) The application of computers to systematic bibliography.

[7] Staveley (1962) is a bibliographic essay, or a range of bibliographical essays, on subject bibliographies rather than a theoretical discussion of subject bibliography as a field. The book is divided into a series of chapters each dealing with kinds of subject bibliographies or related concepts, including library catalogues, indexing and abstracting services, thesis literature, and statistics.

[8] Besterman (1940) is a historical survey of systematic bibliography from the manuscript age (i.e., before printing) to (and including) the seventeenth century. The book argues against Greg's exclusion of systematic bibliography from the field of bibliographical studies, and provides (p. 30-31) a classified table of kinds of bibliographies to the end of the sixteenth century, including universal bibliographies, national bibliographies, and subject bibliographies (all groups subdivided). It should also be mentioned that Besterman served as the first editor of *Journal of Documentation* from 1945-1947. Le Maistre (1947, 1) wrote: "The inauguration of the Journal was entirely due to Mr. Besterman's energy and faith in its potentialities."

[9] Greg (1930, 242-3) support the view that the theory of enumerative bibliography is more related to information science than to his perception of bibliography, writing: "London not only boasts a professorship, but has also, at University College, a lectureship, which for several years has been held with distinction by Mr. Esdaile. Its subject, however, is what I should describe as librarianship rather than bibliography—at least the very useful little book [Esdaile 1963] which is, I understand, the outcome of one course delivered, is mainly concerned with such help in finding one's way about among books as a librarian might be expected to supply for his readers."

[10] W. W. Greg, A. W. Pollard, Fredson Bowers, R. B. McKerrow, and Philip Gaskell are often considered part of the movement called "new bibliography" and presented as such by de Fremery (2024, 155ff.)

References

Balsamo, L. (1990), *Bibliography: History of a Tradition*. Translated from the Italian by W. A. Pettas, Bernard M. Rosenthal, Berkeley, CA.

Bates, M. J. (1976), "Rigorous systematic bibliography." *RQ* [*Reference Quarterly*], Vol. 16, No. 1, pp. 7-26.

Bazerman, C. (1988), *Shaping Written Knowledge: The Genre and Activity of the Experimental Article in Science*. University of Wisconsin Press, Madison, WI.

Bellofiore, R. and Fineschi, R. (Eds.), (2009), *Re-Reading Marx: New Perspectives after the Critical Edition*, Palgrave Macmillan, Basingstoke, UK.

Besterman, T. (1940), *The Beginnings of Systematic Bibliography*. 2. ed., rev. (Reprinted 1968), Franklin, New York, NY.

Bowers, F. (1949), *Principles of Bibliographical Description*. Princeton University Press, Princeton, NJ.

Bowers, F. (1952. "Bibliography, pure bibliography, and literary studies." *The Papers of the Bibliographical Society of America*, Vol. 46, No. 3, pp. 186-208.

Bowers, F. (1971), "Four faces of bibliography." *Papers of the Bibliographical Society of Canada, Vol.* 10, No. 1, pp. 33-45. https://doi.org/10.33137/pbsc.v10i1.16843

Briet, S. (2006), *What is Documentation?* Translated and edited by Ronald E. Day, Laurent Martinet with Hermina G.B. Anghelescu. Scarecrow Press, Lanham, MD. (Original: *Qu'est-ce que la Documentation?* Documentaires Industrielles et Techniques, Paris, 1951).

Buckland, M. (1991), "Information as thing." *Journal of the American Society for Information Science,* Vol. 42, No. 5, pp. 351-360. https://doi.org/10.1002/(SICI)1097-4571(199106)42:5<351::AID-ASI5>3.0.CO;2-3

Buckland, M. (2018), "Document theory". *Knowledge Organization,* Vol. 45, No. 5, pp. 425-436. Also available in *ISKO Encyclopedia of Knowledge Organization*, ed. Birger Hjørland and Claudio Gnoli, http://https://www.isko.org/cyclo/document

Buckland, M. (2024), "From Bibliography to documentography." *Proceedings from the Document Academy*, Vol. 5, No. 2, article 2. https://escholarship.org/uc/item/7tx5337f

Darnton, R. (2007), "What is the history of books?" revisited. *Modern Intellectual History*, Vol. 4, No. 3, pp. 495-508. http://dx.doi.org/10.1017/S1479244307001370

de Fremery, W. (2024), *Cats, Carpenters, and Accounts. Bibliographical Foundations of Information Science*. The MIT Press, Cambridge, MA. Open Access at https://direct.mit.edu/books/oa-monograph/5773/Cats-Carpenters-and-AccountantsBibliographical

Egan, M. E. and Shera, J. (1952), "Foundations of a theory of bibliography." *Library Quarterly*, Vol. 22, No. 2, pp. 125–37. https://doi.org/10.1086/617874

Esdaile, A. (1963), *A Student's Manual of Bibliography*. Revised by Roy Stokes. 3rd edition, 5th impr. Allen & Unwin, London, UK.

Foot, M. M. (2006), "The study of books." *Aslib Proceedings*, Vol. 58, Nos. 1-2, pp. 20-33. DOI 10.1108/00012530610648653

Frank, P. R. (1978), „Einleitung." In *Von der systematischen Bibliographie zur Dokumentation*, ed. Peter R. Frank. Wissenschaftliche Buchgesellschaft, Darmstadt, Germany, pp. ix-xxiv.

Gants, D.L. (2010), "Descriptive bibliography and electronic publication." In *Textual Cultures: Cultural Texts*, Eds. O. D. Rold and E. Treharne. Brewer, Cambridge, pp. 121-140. https://doi.org/10.1515/9781846158902-009

Garfield, E. (1980), "Is information retrieval in the arts and humanities inherently different from that in science? The effect that ISI's citation index for the arts and humanities is expected to have on future scholarship." *Library Quarterly*, Vol. 50, No. 1, pp. 40–57.

Gaskell, P. (1974), *A New Introduction to Bibliography*, reprint wit corrections. The Clarendon Press, Oxford, UK.

Gödel, K. (1931), "Über formal unentscheidbare Sätze der Principia Mathematica und verwandter Systeme I" ("On Formally Undecidable Propositions of Principia Mathematica and Related Systems I"), *Monatshefte für Mathematik und Physik*, Vol. 38, No. 1, pp. 173–198.

Greetham, D. C. (1994), *Textual Scholarship: An Introduction*. Garland Publishing, New York, NY.

Greg, W. W. (1913), "What is bibliography?" *The Library*, Vol. 12, No. 1, pp. 39-53.

Greg, W. W. (1930), "The present position of bibliography." *The Library*, Fourth series, Vol. 11, No. 3, pp. 241-62.

Grenersen, G., Kemi, K. and Nilsen, S. (2016), "Landscapes as documents: The relationship between traditional Sámi terminology and the concepts of document and documentation." *Journal of Documentation*, Vol. 72, No. 6, pp. 1181-1196. DOI: 10.1108/JD-01-2016-0010

Hale, B. M. (1970). *The Subject Bibliography of the Social Sciences and Humanities.* Pergamon Press, Oxford, UK.

Harris, N. (2004), "Definitions of bibliography, and in particular of the variety called analytical." Part of *Analytical bibliography. An Alternative Prospectus,* L'Institut d'histoire du livre, Lyon, France. http://ihl.enssib.fr/analytical-bibliography-an-alternative-prospectus/definitions-of-bibliography-and-in-particular-of-the-variety-called-analytical .

Henri, J. and Hay, L. (1994), "Beyond the bibliographic paradigm: User education in the information age." 60th IFLA General Conference - Conference Proceedings - August 21-27, 1994. Retrieved 2007-05-22 from: http://www.ifla.org/IV/ifla60/60-henj.htm

Hibberd, L. (1965), "Physical and reference bibliography." *Library* 5th ser., Vol. 20, No. 2, pp. 124-134.

Hjørland, B. (2007), "Arguments for 'the bibliographical paradigm': some thoughts inspired by the new English edition of the UDC." *Information Research. An International Electronic Journal*, Vol. 12, No. 4, paper colis06. https://informationr.net/ir/12-4/colis/colis06.html

Hjørland, B. (2013), "Information science and its core concepts: levels of disagreement." In *Theories of Information, Communication and Knowledge: A Multidisciplinary Approach*, Eds. F. Ibekwe-SanJuan and T. M. Dousa. Springer, Dordrecht, the Netherlands, 205-235. https://doi.org/10.1007/978-94-007-6973-1_9

Hjørland, B. (2018a), "Library and information science (LIS), Part 1." *Knowledge Organization*, Vol. 45, No. 3, pp. 232-254. DOI:10.5771/0943-7444-2018-3-232.

Hjørland, B. (2018b), "Library and information science (LIS), Part 2." *Knowledge Organization*, Vol. 45, No. 4, pp. 319-338. DOI:10.5771/0943-7444-2018-4-319.

Hjørland, B. (2021), "Information retrieval and knowledge organization: A perspective from the philosophy of science." *Information*, Vol. 12, No. 3, article 135. https://doi.org/10.3390/info12030135

Hjørland, B. (2023a), "Bibliographical control". *Knowledge Organization*, Vol. 50, No. 4, pp. 301-315. Also available in *ISKO Encyclopedia of Knowledge Organization*, eds. Birger Hjørland and Claudio Gnoli, https://www.isko.org/cyclo/control

Hjørland, B. (2023b), "Description: its meaning, epistemology, and use with emphasis on information science". *Journal of the Association for Information Science and Technology*, Vol. 74, No. 13, pp. 1532-1549. https://doi.org/10.1002/asi.24834.

Hjørland, B. (2024), "Social Epistemology." *Knowledge Organization*, Vol. 51, No. 3, pp. 187-202. DOI: 10.5771/0943-7444-2024-3-187. Also available in *ISK0 Encyclopedia of Knowledge Organization*, eds. Birger Hjørland and Claudio Gnoli. https://www.isko.org/cyclo/se

Kline, R. R. (2004), "What is information theory a theory of? Boundary work among information theorists and information scientists in the United States and Britain during the Cold War". In *The History and Heritage of Scientific and Technical Information Systems: Proceedings of the 2002 Conference, Chemical Heritage Foundation*, eds. W. Boyd Rayward & Mary Ellen Bowden. Information Today, Medford, NJ, 15-28.

Kronick, D. A. (1962), *A History of Scientific and Technical Periodicals: The Origins and Development of the Scientific and Technological Press 1665–1790*. Scarecrow Press, New York, NY.

Krummel, D.W. (1986), *Bibliographies: Their Aims and Methods*, 2nd print. Mansell, London, UK.

Krummel, D W. (1988), "The dialectics of enumerative bibliography: observations on the historical study of the practices of citation and compilation." *Library Quarterly*, Vol. 58, No. 3, pp. 238-257.

Krummel, D.W. (2017), "Bibliography." In *Encyclopedia of Library and Information Sciences* 4th ed. Edited by John D. McDonald and Michael Levine-Clark. CRC Press, Boca Raton, FL, vol. 1, pp. 468-479.

Kuhn, T. S. (1962), *The Structure of Scientific Revolutions*. University of Chicago Press, Chicago, IL.

Le Maistre, C. (1947), "The editor resigns." *Journal of Documentation* 3, No. 1, pp. 1-2.

Lindsey, D. (1978), *The Scientific Publication System in Social Science. A Study of the Operation of Leading Professional Journals in Psychology, Sociology and Social Work*. Jossey-Bass, San Francisco, CA.

Lund, N. W. (2024), *Introduction to Documentation Studies: Complementary Studies of Documentation, Communication and Information*. Facet Publishing, London, UK.

Manzer, B. M. (1977), *The Abstract Journal, 1790-1920. Origin, Development and Diffusion*. The Scarecrow Press, Metuchen, N.J.

McKenzie, D. F. (1969), "Printers of the mind: some notes on bibliographical theories and printing-house practices." *Studies in Bibliography*, Vol. 22, pp. 1-75.

McKenzie, D. F. (1999), *Bibliography and the Sociology of Texts*. Cambridge University Press, Cambridge, UK.

Nash, Andrew, Squires, C. and Willison, I. R. (Eds.), (2019), *The Twentieth Century and Beyond, The Cambridge History of the Book in Britain, Vol. 7.* Cambridge University Press, Cambridge, UK.

Otlet, P. (1990) [1903]. "The science of bibliography and documentation." In *The International Organization and Dissemination of Knowledge: Selected Essays of Paul Otlet*, trans. and ed. W. Boyd Rayward. Elsevier, Amsterdam, Netherlands, 71-86.

Pearl, J. and Mackenzie, D. (2018), *The Book of Why: The New Science of Cause and Effect*. Basic Books, New York, NY.

Reimer, S. R. (2015), "Manuscript Studies, Medieval and Early Modern: I.ii. Four Branches of Bibliographical Study. https://sites.ualberta.ca/~sreimer/ms-course/course/branchs.htm

Robinson, A. M. L. (1979), *Systematic Bibliography: A Practical Guide to the Work of Compilation*; 4th rev. edition with an additional chapter by Margaret Lodder. Clive Bingley, London.

Schneider, G. (1934), *Theory and History of Bibliography*. Translated by Ralph Robert Shaw from the theoretical-historical portion of *Handbuch der Bibliographie*, third edition, 1926. Scarecrow Press New York, NY.

Shera, J. H. (1951), "Classification as the basis of bibliographic organization". In *Bibliographic Organization: Papers presented before the Fifteenth Annual Conference of the Graduate Library School July 24-29, 1950*, ed. J. H. Shera and M. E. Egan, Chicago: Univ. of Chicago Press, 72-93.

Shera, J. H. (1961), "Social Epistemology, General Semantics, and Librarianship." *Wilson Library Bulletin*, Vol. 35, No. 10, pp. 767-770.

Smiraglia, R. P. (2019), "Work". *Knowledge Organization*, Vol. 46, No. 4, pp. 308-319. Also available in *ISKO Encyclopedia of Knowledge Organization*, https://www.isko.org/cyclo/work

Minelli, A. (2024), "Species". *Knowledge Organization*, Vol. 51, No. 1, pp. 38-67. Also available in *ISKO Encyclopedia of Knowledge Organization*, eds. Birger Hjørland and Claudio Gnoli, https://www.isko.org/cyclo/species

Staveley, R. (1962), *Notes on Subject Bibliography*. Andre Deutsch, London, UK.

Tanselle, G. T. (1974),"Bibliography and Science." *Studies in Bibliography*, Vol. 27, pp. 55-89.
Tanselle, G. T. (1977),"Descriptive bibliography and library cataloguing." *Studies in Bibliography*, Vol. 30, pp. 1-56.

Tanselle, G. T. (1990), *Textual Criticism and Scholarly Editing*. Published for the Bibliographical Society of the University of Virginia by the University Press of Virginia, Charlottesville.

White, H. D. (2017), "Relevance in theory." *Encyclopedia of Library and Information Sciences* 4th. ed., Eds. John D. McDonald and Michael Levine-Clark. CRC Press, Boca Raton, FL, vol. VI, pp. 3926-3939.

Wilson, P. (1968), *Two Kinds of Power: An Essay on Bibliographical Control*. University of California Press, Berkeley, CA.

Yee, M. M. (2007), "Cataloging compared to descriptive bibliography, abstracting and indexing services, and metadata." *Cataloging & Classification Quarterly*, Vol. 44, Nos. 3–4, pp. 307–327. https://doi.org/10.1300/J104v44n03_10