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The Long Tail of Forgetting: Libraries, the Web 2.0, and the Phenomenology of Memory

Abstract: This paper uses Ricoeur's phenomenology of memory to compare traditional library information systems and the Web 2.0: social software, tagging systems, file sharing and RSS. Both domains employ strategies of information retention, searching, evocation and reproduction. But the Web 2.0 utilizes a vague principle of "findability," which leads to more diverse tools and a more diffuse objectives.

Résumé : Cette communication utilise la phénoménologie de la mémoire de Ricoeur pour comparer les systèmes d'information traditionnels des bibliothèques et le web 2.0 : les logiciels sociaux, les systèmes d'étiquetage, de partage de fichiers, et les fils de syndication. Les deux domaines utilisent des stratégies de maintien en fonction, de recherche, d'évocation et de reproduction. Cependant, le web 2.0 utilise un vague principe de « repérabilité » menant à des outils plus versatiles et à des objectifs plus diversifiés.

1. Introduction

The World Wide Web has undergone yet another radical transformation over the past five years, and once again libraries and other traditional information services are struggling to define themselves against, and in terms of, this new Web environment. At the 2006 Conference of the Canadian Library Association, Steven Abrams addressed a standing-room-only crowd, hailing the features of this new environment, popularly termed the "Web 2.0." Libraries, he argued, must learn from the Web's successes, and embrace the potential of a new Web characterized by weblogs, wikis, social software, tagging sites, Torrent files, and even, in the form of LibraryThing.com, free cataloguing systems for personal libraries.

While Abrams's enthusiasm is infectious, libraries have good reason for trepidation and caution. Attempts to bridge the gap between library catalogues and early internet sites revealed complex and surprising incongruities. If libraries are to rise to Abrams's challenge and create a "Library 2.0," they must possess a deep understanding of the relationship between these emerging tools and the information systems that have traditionally served the library's efforts to organize and retrieve information: metadata standards, classification systems and controlled-vocabulary indexing. How smooth is the continuum between controlled vocabularies and tagging systems such as del.icio.us, and between the search features of a library catalogue and the search features of Facebook? This paper uses Paul Ricoeur's phenomenological sketch of memory in *Memory, History, Forgetting* (2004) to deepen our understanding of that relationship.

2. Libraries, the Web, Information Architecture and the Web 2.0

Library systems rest upon a long history of declared objectives, ranging from Cutter's objectives of the library catalogue, through Ranganathan's laws of librarianship and the Paris Principles to the International Federation of Library Association's report on *The*

Functional Requirements for Bibliographic Records (FRBR). In both cataloguing theory and information retrieval theory, an information system aims to “match information needs against information messages” (Lancaster & Warner, 1993, 12-13). This matching process involves using a variety of techniques to enhance both recall and precision: ensuring that most of the relevant information has been retrieved, and that most of the information retrieved is relevant (Lancaster & Warner, 1993, 43-44).

Frequently, libraries strive to maximize recall and precision through disambiguation procedures such as authority control, in which the cataloguer’s ability to recognize identities and differences in spite of ambiguous information results in an increase of retrieval efficiency:

If every author ... had a distinct name and appeared always under the same name, ... and if every reader knew always exactly the name of the author ... of the work he wanted, then cataloging—that is, the entry and description of a work—would have been a relatively simple problem The problem of cataloging arises from the fact that this is not the case; that cataloging must concern itself not only with the book in hand but also with the work contained in it, not only with the author’s name but also with his identity, and, beyond these, with the fact that the reader’s information about the name of the author and the title of the book are not infrequently imperfect. (Lubetzky, 1956, 184)

Libraries have also used multiple systems of organization, in hopes that the collocation feature of one system compensates for the dispersal caused by the other; hence, libraries typically use both classification schemes to ensure a meaningful order of documents on the shelves, and controlled vocabularies to collocate similar materials that might, because of the classification system’s insistence on a single location, be shelved in different places (Williamson, 1996, 157).

With the advent of the World Wide Web in the early 1990s, the library community attempted to adapt these techniques of metadata description, authority control and classification to include Internet resources, and the efforts proved to be problematic. Attempts to catalogue Internet resources for inclusion in OPACs uncovered perplexing incongruities (Campbell, 2000), and ultimately worked only in a restricted range of resources. Efforts to encourage information providers to include Dublin Core metadata into their HTML headers floundered when spammers ended up using the headers to increase the hits on their sites (Lynch, 2000). And despite the repeated efforts of academic and public libraries to make their online catalogues attractive to their younger users, Web-based OPACs have not impressed Google-trained users with their usability (Fast & Campbell, 2004).

Better solutions are evolving. Various communities are developing and implementing metadata application profiles, which take loose standards such as the Dublin Core and add tighter and more rigorous input and interpretive standards to suit the needs of specific communities. The Open Archives Initiative’s metadata harvesting protocol makes it possible for different catalogues to be combined using unqualified Dublin Core elements as the *lingua franca*. And the World Wide Web Consortium continues to develop the Semantic Web: a system of standards based on rigorous disambiguation procedures to enhance machine interpretation of data for specific circumstances, many of which could have applications for libraries (Campbell & Fast, 2004).

In addition to these metadata solutions, the Information Architecture community has effectively deployed many basic concepts of information retrieval for use within corporate and other organizational Web environments. Information architects frequently define organization, labeling, navigation and searching systems as the key components of their work (Rosenfeld & Morville, 2002, 46). Principles of classification, vocabulary control and authority control have resurfaced in fresh Web contexts, in the form of synonym rings, site hierarchies and faceted browsing tools. These redefinitions, however, aim not at traditional information retrieval but at a series of more ambiguous objectives, centered around the user experience, user processes and navigation. Morville (2005) argues for “findability” as the primary concept in an information environment, defined as:

- a. The quality of being locatable or navigable.
 - b. The degree to which a particular object is easy to discover or locate.
 - c. The degree to which a system or environment supports navigation and retrieval.
- (4)

And now, a new suite of tools and applications has entered the mainstream of information life, defined by Tim O’Reilly in 2005 as “Web 2.0”: a set of “principles and practices” that are founded on services rather than software, user control and user participation, scalability from small to large, remixable data sources and data transformations, and the harnessing of collective intelligence (O’Reilly, 2005). Typical applications of the Web 2.0 include:

- File sharing systems such as *Flickr* and *UTube*;
- Search engines such as Google that rank pages according to user links;
- User tagging systems such as *Flickr*, *del.icio.us*, *Connotea* and *CiteUlike*;
- Torrent files that enable a file to be constructed from multiple parts downloaded from multiple users;
- Collaborative projects such as *Wikipedia*;
- Wiki systems for corporate collaboration;
- Social networking platforms such as *MySpace* and *Facebook*;
- Syndication standards such as RSS for podcasting;
- Weblogs for continuous online journal entries.

Many of these tools have rough analogues in the library community. File sharing with MARC has been around since the 1960s; controlled vocabularies have been used to tag information objects; bibliographic utilities, controlled vocabularies and classification schemes are massive collaborative projects; serials cataloguers have grappled with the problems of serial content for decades.

Nonetheless, if, as O’Reilly suggests, these tools are intrinsically user-centered, and built on the principle of harnessing collective intelligence, the similarities may be misleading. And if libraries are to fit their systems into a working relationship with these new developments, we need to understand how such concepts as user needs and collective intelligence differ in library manifestations and those of the Web 2.0 applications.

3. Why Philosophy? Why Phenomenology? Why Ricoeur?

Scholars have been tackling the impact of the Web ever since it appeared, and from a variety of perspectives. Some have analyzed the legal and policy implications of code (Lessig, 1999); others more closely tied to information studies have used informetric measurements to explore the between conventional library systems and social tagging (Kipp, 2006).

While these efforts are useful and are producing promising results, an approach from the perspectives of philosophy has certain advantages of its own. To compare library systems with Web 2.0 systems, we need to compare the basic knowledge landscape, related to but distinct from the concrete systems with their various functionalities and limitations. A philosophic approach could be helpful, considering that many of the terms currently used in Web systems, such as taxonomy and ontology, originated in philosophic discourse.

The phenomenological approach also has specific advantages. Phenomenology studies “the structures of experience, in particular consciousness, the imagination, relations with other persons, and the situatedness of the human subject in society and history” (Armstrong, 1994, 562). Both libraries and Web 2.0 systems profess to harness collective intelligence; we need, therefore, an approach that tackles human reasoning, not just as something solely personal and psychological, but as something that manifests itself in collective contexts.

Library systems have traditionally posited a link between information and memory; Dewey’s adoption of Bacon’s connection of memory with history suggests that libraries, to some degree, are vehicles for the preservation of social memory. Lewis Lapham, in his recent tribute to the historical Arthur Schlesinger, cited both Schelesinger’s connection of history with memory, and his connection of history with libraries (Lapham, 2007, 9). And while the Web has a reputation for being cruel to memory, with its power of effacing old content through updates rather than archiving, the proliferation of weblogs attests to a powerful concern with memory, and the recording of events and sensations for future reference.

Ricoeur’s exploration of memory, history and forgetting provides a theoretical and philosophical structure for exploring memory; equally important, he explores these phenomena in a fashion that bridges between the personal and the collective. In his opening insistence on an object-oriented approach to memory (which gives precedence to the question “Of *what* are memories?” over the questions “*Whose* memory is it?”), Ricoeur argues for a more sophisticated and satisfying bridge between the individual and the collective than one of mere analogy: “If the ‘I’ in the first person singular is too hastily declared the subject of memory, the notion of collective memory can take shape only as an analogical concept, even as a foreign body in the phenomenology of memory” (Ricoeur, 2004, 3). Since both libraries and Web 2.0 systems profess to harness collective intelligence in their different ways, Ricoeur’s sophistication may prevent us from too readily treating collective intelligence as a mere allegory to what is going on in our heads.

Ricoeur bases his phenomenology of memory largely on Aristotle’s famous dictum: “all memory is of the past.” Memory, whether collective or personal, can be defined effectively by analyzing the relationship between the present of the memory and the past of the event or concept or thing remembered:

The descriptive operation then consists in arranging experiences relative to temporal depth, beginning with those in which the past adheres, so to speak, to the present and continuing on to those in which the past is recognized in its pastness as over and done with.” (Ricoeur, 2004, 25).

In his phenomenological sketch of memory, Ricoeur aims to chart those relative positions of temporal depth. In so doing, he makes a series of oppositions, three of which are especially relevant to a comparison of library and Web 2.0 systems:

- Evocation and search;
- Habit and recollection;
- Retention and reproduction.

These three oppositions will form the basis of the following comparison between these different visions of information and information services.

4. Evocation vs. Search

Ricoeur adopts an important distinction made by Aristotle between:

- “evocation”: termed *mneme* by Aristotle, this signifies an “affection,” or the unexpected appearance of the memory. This unexpected evocation is typically triggered by another event or object with which the memory is associated.
- “search”: termed *anamnesis* by Aristotle, this signifies the purposive attempt to retrieve a specific memory.

Libraries have traditionally exploited evocation in the design of information systems. Classification schemes attempt to predict, through a wide variety of tools and methods, the optimal way to place physical documents in a meaningful arrangement that enables the presence of one document to inspire an interest in another. Hierarchies express entrenched societal assumptions about subjects and disciplines; facets and facets formulas synthesize numbers in intuitive and helpful ways; concepts of canonical, alphabetical, and evolutionary order establish useful order across an array. All of these methods enable a user to encounter a useful document without actually looking for it. Similarly, a library database’s system of syndetic references, subject headings and authority control all work to support search strategies, as do the interface designs of databases that support Boolean queries.



Figure 1: Tag Cloud in *del.icio.us*

If we take tag clouds as a typical instance of facilitating browsing in Web 2.0 tools, we can see a similar co-existence of searching and browsing tools. In Figure 1, the popular tags in *del.icio.us* appear as a cloud, in which links to the more popular tags are larger than those to less popular tags, and those shared by the logged-in user appear in red. And, as counterpoint to this evocative scenario, the search box in the upper-right corner allows the user to by-pass the cloud altogether and enter query terms.

The use of size, colour and shape to evoke connections should be no surprise; the rise of the first-generation Web in the 1990s galvanized information science research into human-computer interaction, and many different studies showed that users develop sophisticated techniques of browsing (Toms, 2000), as well as responding to a combination of spatial and semantic cues in large information spaces (Dillon, 2000).

There are, however, two important differences between the evocation/search dynamic in Web environments. First, in some fields such as information architecture, search activity tends to be taken more seriously as a communication from user to system, and in some cases is interpreted as a sign of browsing failure. Practitioners of web analytics use data on query terms to determine from which pages in a site the terms were entered, as signs that the browsing structure failed (Rosenfeld & Wiggins, 2007).

Second, in keeping with the notion of collective intelligence, the browsing display leads users to well-travelled places. Like the PageRank system in Google, tag clouds frequently highlight tags according to other verdicts of value. As with libraries, the evocation process, whereby a piece of information is recalled without a conscious search, is typically split between different people; the person who stores the referenced document is not the one who retrieves it. But where library systems attempt to confine themselves to the innate “aboutness” of the document, Web 2.0 tagging systems turn the evocation process into an inherently social activity.

5. Habit vs. Recollection

Ricoeur draws on Henri Bergson to draw a distinction between:

- Memory as “habit”: typically in the form of a lesson learned by heart and recited rapidly and automatically;
- Memory as “recollection,” in which the person recalls a specific event that is marked with a date as something in the past.

At first glance, this bears a strong resemblance to Donald Norman’s distinction between experiential and reflective cognition (Norman, 1993). Ricoeur, however, uses Bergson to base his distinction not on the cognitive activity as such, but on the relationship to the past. Memory as habit takes what was acquired in the past and incorporates it into the present, “unmarked, unremarked as past” (Ricoeur, 2004, 24). Recollection, on the other hand, is memory that “imagines,” by calling up the past “in the form of an image” (Ricoeur, 2004, 25).

<p>LC Control Number: sh 85023022</p> <p>LC Class Number: QD241 QD441</p> <p><u>HEADING:</u> Chemistry, Organic</p> <p><u>Used For/See From:</u> Organic chemistry</p> <p><u>Search Also Under:</u> <u>Chemistry</u></p> <p>groups and classes of organic compounds and individual organic substances</p>
<p>LC Control Number: sh 85044168</p> <p>LC Class Number: TD193</p> <p><u>HEADING:</u> Environmental chemistry</p> <p><u>Used For/See From:</u> Chemistry, Environmental</p> <p><u>Search Also Under:</u> <u>Chemistry</u></p> <p><u>Ecology</u></p>

Figure 2: Subject Authorities from the Library of Congress

Library systems typically show patterns of both habit and recollection. Tools such as vocabularies, cataloguing standards, MARC standards and classification schedules undergo constant revisions, most of them minor alterations that are noted in bulletins or loose-leaf updates.

As we can see from Figure 2, because revisions to tools are frequently localized, they lead to inconsistencies. The heading **Chemistry, Inorganic** reflects an earlier tradition of inverting subject headings, so that a common entry element would cause related headings to appear together in an alphabetic sequence. The heading **Environmental chemistry** reflects a later decision to abandon inverted headings in favour of a presumably more intuitive order of words. But the older tradition still lives on in the heading for **Chemistry, Inorganic**; while it no longer reflects current practice, it remains as a habit from the past, incorporated into the present.

At other times, tools are systematically overhauled, and the older versions are consigned to the past. Selected parts of the DDC schedules have been subjected to massive overhauls, formerly known as phoenix schedules; the *Anglo-American Cataloguing Rules* will eventually be replaced by the overhauled *Rules for Description and Access* (RDA).

These overhauls are typically powerful imaginative acts, as well as tributes to the stubborn endurance of revision committees. However, this pattern of imaginative recollection is crucially different from the recollection described by Ricoeur and Bergson: instead of imaginatively recreating an event in the past, libraries who overhaul their systems in this way consign their systems to the past, in favour of an imaginatively reconstructed, new incarnation. Revisions of this type are not so much gestures of memory but of forgetting: of consigning relationships and practices that have come to be seen as unhelpful, old-fashioned, biased or prejudiced. By consigning these relationships and practices to relative oblivion, the systems designers are imagining a future rather than a past, and using the powers of forgetting to bring that future about.



url	<input type="text" value="http://www.cais-acsi.ca/"/>
description	<input type="text" value="CAIS"/>
notes	<input type="text" value="The main page of the Canadian Association for Information Science."/>
tags	<input type="text" value="conferences CAIS information_science"/>

recommended tags
conferences information science

your tags » sort: alphabetically | by frequency
_engines AACR academic aggregator AI alzheimer's
alzheimers Bates bibliography bioinformatics bittorrent Blog blogging books calendar
catalog cataloguing classification conferences data database datamining db2
DeweyDecimal digital_Humanities digital_libraries Digital_Universe drama

Figure 3: Entry Form for del.icio.us Bookmark

As for the Web 2.0, imaginative recollection also looks to the future, frequently involving a prediction of future needs. Social bookmarking systems involve a process that resembles that of cataloguing: in assigning tags to a bookmarked site, the user imagines what will make the site findable in various ways: using recommended tags, drawing on his or her own supply of tags, or using tags that others have used for the same page (see Figure 3). In so doing, the user is engaging, not in active recollection, but in an imaginative enactment of a future recollection.

Habit, on the other hand, emerges as a peculiar form of forgetting. With the monumental increases in disk size and storage capacity, the need to clean up of old files has become less urgent. As a result, services such as Google's Gmail offer over two gigabytes of storage for e-mail: "With so much space," the help screen assures us, "you can keep every message you send or receive, and take advantage of Google's search technology to retrieve them" [http://mail.google.com/support/bin/answer.py?answer=6558&topic=1547]. Massive storage, together with search engines and tagging systems, make it unnecessary to delete the old. And on the Web, one frequently encounters screens such

as one sees in Figure 4: a popular query that retrieves 4033 torrent files, many of which have long since become inactive.

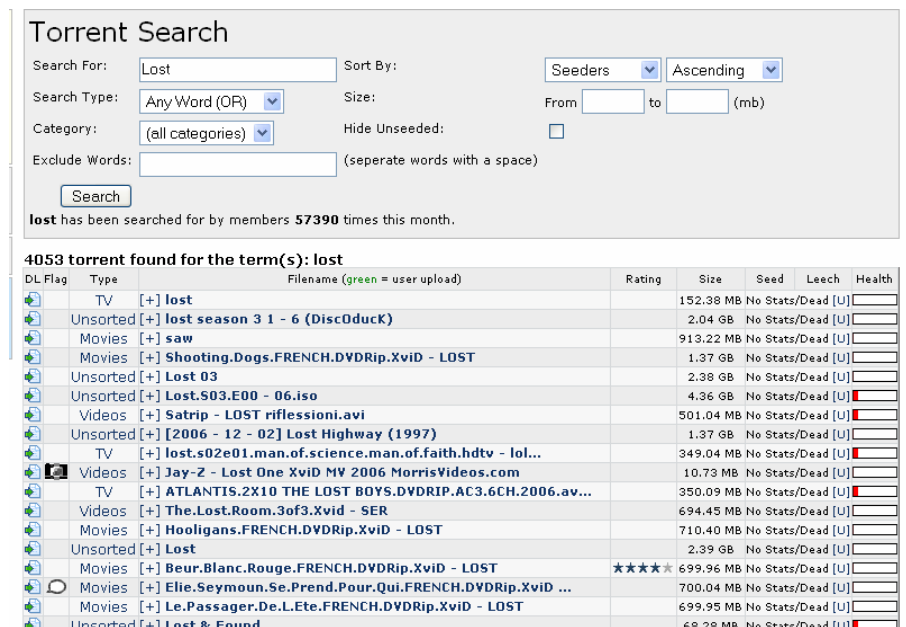


Figure 4: Dead Torrents in a BitTorrent Metaindex

6. Retention vs. Reproduction

Closely related to the habit/recollection distinction, Ricoeur offers a distinction, drawn from Husserl, between:

- Retention: in which the perception of the moment continues and persists, after the event has moved into the past. With retention, the sensation, or perception, are still present;
- Reproduction: in which the primary memory of a temporal object, such as melody, has disappeared and then reappears (Ricoeur, 2004, 35).

If, Ricoeur argues, the reproduced memory coincides with a past reality, “the reproduced now can be said to ‘coincide’ with a past now. This ‘double intentionality’ corresponds to what Bergson and others have called recognition—the conclusion to a happy quest” (Ricoeur, 2004, 36).

This opposition extends Ricoeur’s notion of recollection—an imaginative act—into a complex relationship that evokes Plato’s distinction between the eikon, which is the representation of an absent thing, and phantasma, the product of pure imagination. Here, the truthfulness of the memory lies in the degree to which the imaginative act, often associated with phantasma, is true to the past event.

Web 2.0 products and services tend to collect on the retention side of this opposition. Despite the many real problems that plague the archiving of electronic records, many Web 2.0 tools are more concerned with accretion to an existing store than weeding or deleting the old files. RSS feeds and podcasts add to an ever-lengthening line of resources; weblogs frequently maintain massive archiving capabilities, enabling current

entries to be added to the sequence without deleting the old. In this sense, the Web shows the characteristics of lived space rather than measured space (Weinberger, 2002).

Libraries, on the other hand, have always weeded collections, and have always been concerned with removing dangerously outdated editions that could mislead. In this sense, they have always shown a commitment to forgetting, and it is useful at this point to remind ourselves that such forgetting has an honourable history. Margaret Anne Doody traces a tradition of memory and forgetting through eighteenth-century English literature and thought, concluding with Elizabeth Bennet's decision to "forget" her earlier dislike of Mr. Darcy: "in such cases as these, a good memory is unpardonable" (Doody, 2001, 94).

7. Conclusion

This paper is part of a broader study that examines the continuities and discontinuities between library information systems and those emerging on the World Wide Web. As such, it stands only shakily on its own. Nonetheless, Ricoeur's phenomenology of Memory has highlighted three important distinctions between library systems and the Web 2.0.

- While both library systems and Web 2.0 tools frequently use both evocation and recall in the use of both browsing and search features, Web 2.0 tools bring a social aspect into the browsing function by highlighting the well-travelled, popular practices of others;
- Web 2.0 tools frequently employ the concept of memory as both habitual and retentive, in which the virtual environment with its massive storage capacity and disconnection with physical space enables files and resources to be used and discarded without disappearing, but merely vanishing into the "long tail" of the hit list;
- Libraries, on the other hand, frequently employ memory as an imaginative and recollective act; however, their wholesale revisions of standards and weeding of collections has more to do with rational and purposive decisions to forget, rather than to remember.

This last point suggests an ingrained commitment to human interpretation on the part of libraries, along with an equally ingrained skepticism towards the concept of the "self-organizing system" that lies behind the claims of collective intelligence on the Web 2.0. If libraries are to function as the collective memory of a culture, they must cultivate sophisticated arts of forgetting; users must sever their habitual and retained allegiances to prior conceptions and perceptions, if they are to get useful access to the past.

8. References

- Armstrong, Paul B. 1994. Phenomenology. *The Johns Hopkins guide to literary theory and criticism*. Ed. Michael Groden and Martin Kreiswirth. Baltimore: Johns Hopkins University Press: 562-566.
- Campbell, D. Grant. 2000. Straining the standards: how cataloging websites for curriculum support poses fresh problems for the *Anglo-American Cataloging Rules*. *Journal of internet cataloging* 3: 79-92.

- Campbell, D. Grant & Karl V. Fast. 2004. Academic libraries and the Semantic Web: what the future may hold for research-supporting library catalogues. *Journal of academic librarianship* 30(5): 382-390.
- Dillon, Andrew. 2000. Spatial-semantics: how users derive shape from information space. *Journal of the American Society for Information Science and Technology* 51(6): 521-528.
- Doody, Margaret Anne. 2001. 'A good memory is unpardonable': self, love, and the irrational irritation of memory. *Eighteenth-century fiction* 14 (1): 67-94.
- Fast, Karl V. and D. Grant Campbell. 2004. 'I still like Google': university student perceptions of searching OPACS and the Web." *Managing and enhancing information: cultures and conflicts: proceedings of the 2004 Annual Meeting of the American Society for Information Science, Providence, Rhode Island, 13-18 November*.
- Kipp, Margaret E.I. 2006. Presentation: Exploring the context of user, creator and intermediate tagging. Presentation for the 7th Annual Information Architecture Summit, Vancouver, 23-27 March. [<http://www.iasummit.org/2006/conferencedescrip.htm#109>]
- Lancaster, F. Wilfrid, and Amy J. Warner. 1993. *Information retrieval today*. Revised, retitled and expanded edition. Arlington: Information Resources Press.
- Lapham, Lewis H. 2007. Time travel. *Harper's magazine* May 2007: 9-11.
- Lessig, Lawrence. 1999. *Code and other laws of cyberspace*. Cambridge: Perseus.
- Lubetzky, Seymour. 1956. Some observations on revision of the cataloguing code. Rpt. *Writings on the classical art of cataloging*. Compiled and edited by Elaine Svenonius and Dorothy McGarry. Englewood: Libraries Unlimited, 2001: 181-187.
- Lynch, Clifford. 2000. When documents deceive: trust and provenance as new factors for information retrieval in a tangled web. *Journal of the American Society for Information Science and Technology* 52(1): 12-17.
- Morville, Peter. 2005. *Ambient findability*. Sebastopol: O'Reilly.
- Norman, Donald A. 1993. *Things that make us smart: defending human attributes in the age of the machine*. Cambridge: Perseus.
- O'Reilly, Tim. 2005. *What is Web 2.0: design patterns and business models for the next generation of software*. Online [<http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>]
- Ricoeur, Paul. 2004. *Memory, history, forgetting*. Trans. Kathleen Blamey and David Pellauer. Chicago: University of Chicago Press.
- Rosenfeld, Louis and Peter Morville. 2002. *Information architecture for the World Wide Web*. 2nd ed. Sebastopol: O'Reilly.

- Rosenfeld, Louis and Rich Wiggins. 2007. Using search analytics to diagnose what's ailing your IA. Presentation for the 8th Annual Information Architecture Summit, Las Vegas, 22-26 March. Online. [http://www.iasummit.org/proceedings/2007/using_search_analytics_to_diag]
- Toms, Elaine G. 2000. Serendipitous information retrieval: a position paper for the European Research Consortium for Informatics and Mathematics. Workshop conducted at the First DELOS network of excellence workshop on information seeking, searching and querying in digital libraries, Zurich, 11-12 December. Online. [http://www.ercim.org/publication/ws-proceedings/DeINoe01/3_Toms.pdf]
- Weinberger, David. 2002. *Small pieces loosely joined: a unified theory of the Web*. Cambridge: Perseus.
- Williamson, Nancy. 1996. Standards and rules for subject access. *Cataloging & classification quarterly* 21: 155-176.