UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC and YOUTUBE, LLC,
Petitioners

v.

ROBOCAST, INC.,
Patent Owner

U.S. Patent No. 8,965,932 B2
Issue Date: February 24, 2015

DECLARATION OF JAMES L. MULLINS, PhD

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I, Dr. James L. Mullins, declare as follows:

I. INTRODUCTION

1. I have been retained by petitioner Google LLC and YouTube, LLC ("Petitioner") in the above-captioned *inter partes* review to provide opinions on various documents.

2. I am presently Dean Emeritus of Libraries and Esther Ellis Norton Professor Emeritus at Purdue University. My career as a professional and academic/research spanned more than 44 years including library positions at Indiana University, Villanova University, Massachusetts Institute of Technology, and Purdue University. Appendix A is a true and correct copy of my curriculum vitae describing my background and experience.

3. In 2018, I founded the firm Prior Art Documentation Librarian Services, LLC, now located at 205 Saint Cuthbert, Williamsburg, VA 23188 after purchasing the intellectual property of and successor to Prior Art Documentation, LLC located at 711 South Race Street, Urbana, IL 61801. Further information about my firm, Prior Art Documentation Librarian Services, LLC (PADLS), is available at www.priorartdoclib.com.

4. I have been retained by the Petitioner to offer my opinion on the authenticity and dates of public accessibility of various documents. For this service, I am being paid my usual hourly fee of $275.00. I have no stake in the outcome of

this proceeding or any related litigation or administrative proceedings, and my compensation in no way depends on the substance of my testimony or the outcome of this proceeding.

II. QUALIFICATIONS

5. I received a Bachelor of Arts degree in History, Religion and Political Science in 1972 as well as a Master of Arts degree in Library Science in 1973 from the University of Iowa. I received my Ph.D. in Academic Library Management in 1984 from Indiana University. Over forty-four years, I held various positions as a leader in the field of library and information sciences.

6. I am presently Dean Emeritus of Libraries and Esther Ellis Norton Professor Emeritus at Purdue University, and have been since January 1, 2018. I have been previously employed as follows:

- Dean of Libraries and Professor and Esther Ellis Norton Professor, Purdue University, West Lafayette, IN (2004-2017)
- Assistant/Associate Director for Administration, Massachusetts Institute of Technology (MIT) Libraries, Cambridge, MA (2000-2004)
- University Librarian and Director, Falvey Memorial Library, Villanova University, Villanova, PA (1996-2000)
- Director of Library Services, Indiana University South Bend, South Bend, IN (1978-1996)
- Part-time Instructor, School of Library and Information Science, Indiana University, Bloomington, IN (1979-1996)
- Associate Law Librarian, and associated titles, Indiana University School of Law, Bloomington, IN (1974-1978)

- Catalog Librarian, Assistant Professor, Georgia Southern College (now University), Statesboro, GA (1973-1974)

7. I am a member of the American Library Association ("ALA"), where I served as the chair of the Research Committee of the Association of College and Research Libraries ("ACRL"). My service to ALA included service on the editorial board of the most prominent library journal, *College and Research Libraries*. I also served on the Standards Committee, College Section of the Association of College and Research Libraries, where I was instrumental in developing a re-issue of the *Standards for College Libraries* in 2000.

8. I am an author of numerous publications in the field of library science, and have given presentations in library sciences at national and international conferences. During more than 44 years as an academic librarian and library science scholar, I have gained extensive experience with catalog records and online library management systems (LMS) built using Machine-Readable Cataloging ("MARC") standards. As an academic library administrator, I have had responsibility to ensure that students were educated to identify, locate, assess, and integrate information garnered from research library resources. I have also facilitated the research of faculty colleagues either directly or through the provision of and access to the requisite print and/or digital materials and services at the universities where I worked.

9. Based on my experience identified above and detailed in my curriculum vitae, which is attached hereto as Appendix A, I consider myself to be an expert in the field of library science and academic library administration. I have previously offered my opinions on the public availability and authenticity of documents in over 115 cases. I have been deposed in one case.

III. BACKGROUND ON PUBLIC ACCESSIBILITY

10. *Scope of This Declaration*. I am not a lawyer, and I am not rendering an opinion on the legal question of whether a particular document is, or is not, a "printed publication" under the law. I am, however, rendering my expert opinion on the authenticity of the document referenced herein and when and how this document was disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, could have located the document.

11. I am informed by counsel that an item is considered authentic if there is sufficient evidence to support a finding that the item is what it is claimed to be. I am also informed that authenticity can be established based on the contents of the document itself, such as the appearance, content, substance, internal patterns, or other distinctive characteristics of the item.

12. I am informed by counsel that a given reference qualifies as "publicly accessible" if it were disseminated or otherwise made available such that a person

interested in and ordinarily skilled in the relevant subject matter could locate it through the exercise of ordinary diligence.

13. While I understand that the determination of public accessibility under the foregoing standard rests on a case-by-case analysis of the facts particular to an individual publication, I also understand that a printed publication is rendered "publicly accessible" if it is cataloged and indexed by a library such that a person interested in the relevant subject matter could locate it (*i.e.*, I understand that cataloging and indexing by a library is sufficient, though there are other ways that a printed publication may qualify as "publicly accessible"). One manner of sufficient indexing is indexing according to subject matter. I understand that it is not necessary to prove someone actually looked at the printed publication in order to show it was publicly accessible by virtue of a library's cataloging and indexing thereof. I understand that cataloging and indexing by a single library of a single instance of a particular printed publication is sufficient. I understand that, even if access to a library is restricted, a printed publication that has been cataloged and indexed therein is publicly accessible so long as a presumption is raised that the portion of the public concerned with the relevant subject matter would know of the printed publication. I also understand that the cataloging and indexing of information that would guide a person interested in the relevant subject matter to the printed publication, such as the

cataloging and indexing of an abstract for the printed publication, is sufficient to render the printed publication publicly accessible.

14. I understand that evidence showing the specific date when a printed publication became publicly accessible is not necessary. Rather, routine business practices, such as general library cataloging and indexing practices, can be used to establish an approximate date on which a printed publication became publicly accessible.

15. *Person of Ordinary Skill in the Art*. In forming the opinions expressed in this declaration, I have reviewed the documents and appendices referenced herein. These materials are records created in the ordinary course of business by publishers, libraries, indexing services, and others. From my years of experience, I am familiar with the process for creating many of these records, and I know that these records are created by people with knowledge of the information contained within the record. Further, these records are created with the expectation that researchers and other members of the public will use them. All materials cited in this declaration and its appendices are of a type that experts in my field would reasonably rely upon and refer to in forming their opinions.

16. I have been informed by counsel that the subject matter of this proceeding relates to the field of computer networks (such as the Internet) and

techniques for sequencing and scheduling presentation of network-accessible resources, such as web pages.

17. I have been informed by counsel that a "person of ordinary skill in the art at the time of the inventions" (POSITA) is a hypothetical person who is presumed to be familiar with the relevant field and its literature at the time of the inventions. This hypothetical person is also a person of ordinary creativity, capable of understanding the scientific principles applicable to the pertinent field.

18. I have been informed by counsel that a person of ordinary skill in this subject matter or art would have included someone with a bachelor's degree in electrical engineering, computer science, or similar field, with at least two years of experience developing and implementing network-based computer systems, such as systems for storing and retrieving information over the Internet or communicating using the Web, and that such a person could also have qualified with more formal education and less technical experience, or vice versa.

19. It is my opinion that such a person would have been actively engaged in academic research and learning through study and practice in the field, and possibly through formal instruction through the bibliographic resources relevant to his or her research. By the 1990s, such a person would have had access to a vast array of print resources, including at least the documents referenced below, as well as to a fast-changing set of online resources.

Library Catalog Records and Other Resources

20. Some background on MARC (Machine-Readable Cataloging) formatted records, OCLC, and WorldCat is helpful to understand the library catalog records discussed in this declaration. I am fully familiar with the library cataloging standard known as the MARC standard, which is an industry-wide standard method of storing and organizing library catalog information.[1] MARC practices have been consistent since the MARC format was developed by the Library of Congress in the 1960s, and by the early 1970s became the U.S. national standard for disseminating bibliographic data. By the mid-1970s, MARC format became the international standard, and persists through the present. A MARC-compatible library is one that has a catalog consisting of individual MARC records for each of its items. The underlying MARC format (computer program) underpins the online public access catalog (OPAC) that is available to library users to locate a particular holding of a library. Today, MARC is the primary communications protocol for the transfer and storage of bibliographic metadata in libraries.[2] The MARC practices discussed

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[1] The full text of the standard is available from the Library of Congress at http://www.loc.gov/marc/bibliographic/.

[2] Almost every major library in the world uses a catalog that is MARC-compatible. *See, e.g.*, Library of Congress, *MARC Frequently Asked Questions (FAQ)*, https://www.loc.gov/marc/faq.html (last visited Jan. 24, 2018) ("MARC is the acronym for MAchine-Readable Cataloging. It defines a data format that

below were in place during the mid-1990s time frame relevant to the documents referenced herein.

21. Online Computer Library Center (OCLC) is a not-for-profit worldwide consortium of libraries. Similar to MARC standards, OCLC's practices have been consistent since the 1970s through the present. Accordingly, the OCLC practices discussed below were in place during the time frame discussed in my opinions section. OCLC was created "to establish, maintain and operate a computerized library network and to promote the evolution of library use, of libraries themselves, and of librarianship, and to provide processes and products for the benefit of library users and libraries, including such objectives as increasing availability of library resources to individual library patrons and reducing the rate of rise of library per-unit costs, all for the fundamental public purpose of furthering ease of access to and use of the ever-expanding body of worldwide scientific, literary and educational knowledge and information."[3] Among other services, OCLC and its members are

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emerged from a Library of Congress-led initiative that began nearly forty years ago. It provides the mechanism by which computers exchange, use, and interpret bibliographic information, and its data elements make up the foundation of most library catalogs used today."). MARC is the ANSI/NISO Z39.2-1994 (reaffirmed 2009) standard for Information Interchange Format.

[3] OCLC Online Computer Library Center, Inc., *Amended Articles of Incorporation of OCLC Online Computer Library Center, Inc.*, Third Article

responsible for maintaining the WorldCat database (http://www.worldcat.org/), used by libraries throughout the world.

22. Libraries worldwide use the machine-readable MARC format for catalog records. MARC-formatted records include a variety of subject access points based on the content of the document being cataloged. A MARC record for a particular work comprises several fields, each of which contains specific data about the work. Each field is identified by a standardized, unique, three-digit code corresponding to the type of data that follows. For example, a work's title is recorded in field 245, the primary author of the work is recorded in field 100, a work's International Standard Book Number ("ISBN") is recorded in field 020, and the work's Library of Congress call number (assigned by Library of Congress) is recorded in field 050. Some fields can contain subfields, which are indicated by letters. For example, a work's publication date is recorded in field 260 under the subfield "c."

23. The MARC Field 040, subfield "a," identifies the library or other entity that created the catalog record in the MARC format. MARC Field 008 identifies the date when this first MARC record was created.

(OCLC, Dublin, Ohio) Revised November 30, 2016, https://www.oclc.org/content/dam/oclc/membership/articles-of-incorporation.pdf.

24. MARC records also include several fields that include subject matter classification information. An overview of MARC record fields is available through the Library of Congress at http://www.loc.gov/marc/bibliographic/. For example, 6XX fields are termed "Subject Access Fields."[4] Among these, for example, is the 650 field; this is the "Subject Added Entry – Topical Term" field. *See* http://www.loc.gov/marc/bibliographic/bd650.html. The 650 field is a "[s]ubject added entry in which the entry element is a topical term." *Id.* The 650 field entries "are assigned to a bibliographic record to provide access according to generally accepted thesaurus-building rules (e.g., *Library of Congress Subject Headings* (LCSH), *Medical Subject Headings* (MeSH))." *Id.* Thus, a researcher can easily discover material relevant to a topic of interest with a search using the terms employed in MARC Fields 6XX.

25. Further, MARC records include call numbers, which themselves include a classification number. For example, the 050 field is dedicated as the "Library of Congress Call Number"[5] as assigned by the Library of Congress. A defined portion of the Library of Congress Call Number is the classification number, and "source of the classification number is *Library of Congress Classification* and the *LC Classification-Additions and Changes*." *Id.* Thus, included in the 050 field

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4 *See* http://www.loc.gov/marc/bibliographic/bd6xx.html.

5 *See* http://www.loc.gov/marc/bibliographic/bd050.html.

is a subject matter classification. As an example: TK5105.59 indicates books on computer networks – security measures. When a local library assigns a classification number, most often a Library of Congress derived classification number created by a local library cataloger or it could be a Dewey Decimal classification number for example, 005.8, computer networks – security measures, it appears in the 090 field. In either scenario, the MARC record includes a classification number in the call number field that represents a subject matter classification.

26. The 9XX fields, which are not part of the standard MARC 21 format,[6] were defined by OCLC for use by the Library of Congress, processing or holding notes for a local library, and for internal OCLC use. For example, the 955 field is reserved for use by the Library of Congress to track the progress of a new acquisition from the time it is submitted for Cataloging in Publication (CIP) review until it is published and fully cataloged and publicly available for use within the Library of Congress. Fields 901-907, 910, and 945-949 have been defined by OCLC for local use and will pass OCLC validation. Fields 905 or 910 are often used by an individual library for internal processing purposes, for example the date of cataloging and/or the initials of the cataloger.

[6] *See* https://www.oclc.org/bibformats/en/9xx.html.

27. *WorldCat* is the world's largest public online catalog, maintained by the OCLC, a not-for-profit international library consortium, and built with the records created by the thousands of libraries that are members of OCLC. OCLC provides bibliographic and abstract information to the public based on MARC-compliant records through its OCLC *WorldCat* database. *WorldCat* requires no knowledge of MARC tags and code and does not require a login or password. *WorldCat* is easily accessible through the World Wide Web to all who wish to search it; there are no restrictions to be a member of a particular community, etc. The date a given catalog record was created (corresponding to the MARC Field 008) appears in some detailed WorldCat records as the Date of Entry but not necessarily all. *WorldCat* does not provide a view of the underlying MARC format for a specific *WorldCat* record. In order to see the underlying MARC format the researcher must locate the book in a holding library listed among those shown in *WorldCat*, and search the online public catalog (OPAC) of a holding library. Whereas *WorldCat* records are widely available, the availability of library specific MARC formatted records varies from library to library. When a specific library wishes to make the underlying MARC format available there will be a link from the library's OPAC display, often identified as a MARC record or librarian/staff view.

28. When a MARC record is created by the Library of Congress or an OCLC member institution, the date of creation for that record is automatically

populated in the fixed field (008), with characters 00 through 05 in year, month, day format (YYMMDD).[7] Therefore, the MARC record creation date reflects the date on which the publication associated with the record was first cataloged. Thereafter, the local library's computer system may automatically update the date in field 005 every time the library updates the MARC record (*e.g.*, to reflect that an item has been moved to a different shelving location within the library, or a reload of the bibliographic data with the introduction of a new library management system that creates and manages the OPAC).

Monograph Publications

29. Monograph publications are written on a single topic, presented at length, and distinguished from an article and include books, dissertations, proceedings of a conference, and technical reports. A library typically creates a catalog record when the monograph is acquired by the library. First, it will search OCLC to determine if a record has already been created by the Library of Congress or another OCLC institution. If a record is found in OCLC, the record is downloaded into the library's LMS (Library Management System) that includes typically the OPAC (online public access catalog by which researchers locate a particular library holding in a user-friendly format), acquisitions, cataloging, and circulation

[7] Some of the newer library catalog systems also include hour, minute, second (HHMMSS).

integrated functions. Once the item is downloaded into the library's LMS, the library adds its identifier to the OCLC database so when a search is completed on *WorldCat*, the library will be indicated as an owner of the title. Once a record is created in a Library's LMS, it is searchable and viewable through the library's OPAC, typically by author, title, and subject heading, at that library and from anywhere in the world through the internet by accessing that library's OPAC. The OPAC also connects with the circulation function of the library, which typically indicates whether the record is available, in circulation, etc., with its call number and location in a specific departmental/disciplinary library, if applicable. The OPAC not only provides immediate bibliographic access on-site, but it also facilitates the interlibrary loan process, which is when one publication is loaned from one library to another.

30. **ACM Digital Library** - Association for Computing Machinery. The ACM was founded in 1947 and is the world's largest scientific and educational computing society. The portal has two main sections: the ACM Digital Library and the ACM Guide to Computing Literature. The ACM Digital Library provides access to the journals, newsletters and conference proceedings of the organization. The Guide to Computing Literature is a bibliography of computing literature beginning in the 1950s with more than a million entries. https://dl.acm.org/

31. ***Wisconsin TechSearch (WTS)*** **–** WTS is a set of services offered by the University of Wisconsin Libraries. WTS offers an array of article delivery and research services to any individual or organization who requests the specialized skills of WTS staff in locating and retrieving information, regardless of whether the individual is affiliated with the University of Wisconsin.

IV. OPINION REGARDING AUTHENTICITY AND PUBLIC ACCESSIBILITY

Document A: EX1004/1104: Bob [Robert C] Benedict. *Using Harvard Graphics Version 2 for Windows.* Que, 1993. 524 pages. ("Benedict")

Authentication

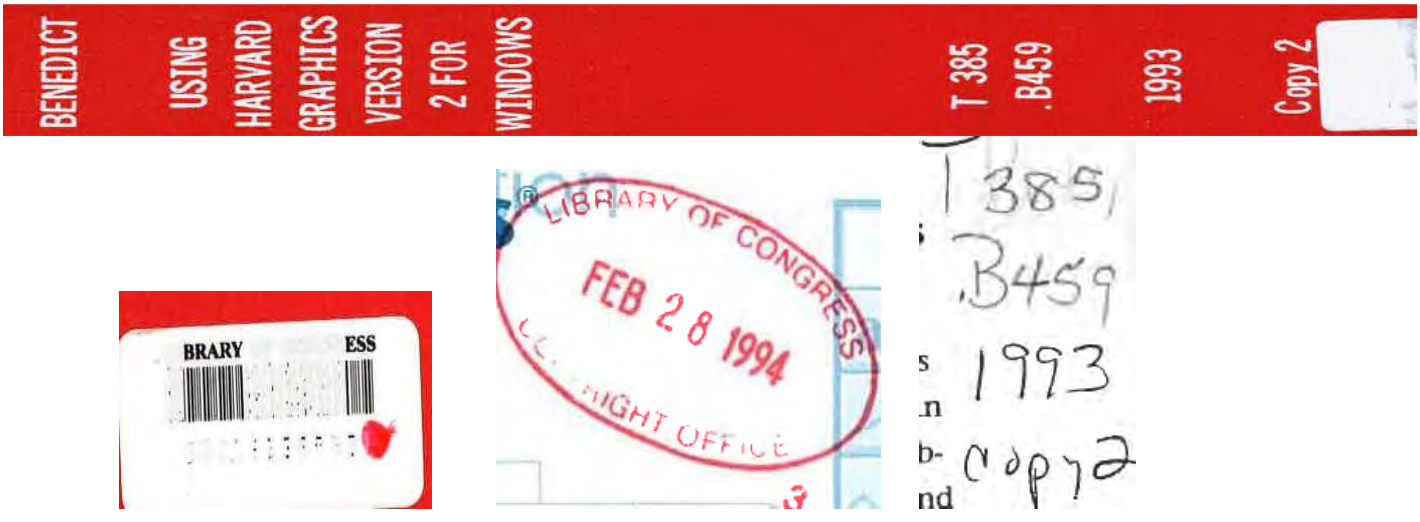
32. I have been asked to opine for a book titled *Using Harvard Graphics Version 2 for Windows,* authored by Bob Benedict. Benedict was published in 1993 by Que. It contains in pages numbered 1 through 524: Introduction; 18 Chapters; Appendices A-D; and an Index.

33. I have evaluated the Benedict reference in two ways: (1) by assessing the digital copy of Benedict, EX1004/1104, provided to me by counsel; and (2) by assessing scans of a copy of Benedict owned by the Library of Congress, that I requested through the Wisconsin TechSearch (WTS) that I received on January 19, 2023, Attachment A-1.

34. EX1004/1104 is a scan of excerpts from a print copy of Benedict, provided to me by counsel. I see no evidence that any alteration or inclusion of pages, etc., were made during the scanning process. The pages follow-on to each

other as expected, therefore, more likely than not, this is an accurate scan of Benedict.

35. Attachment A-1 is a scan provided to me by the Wisconsin Tech Search (WTS) obtained from the copy owned by the Library of Congress. Attachment A-1 includes: bound front, spine, and back cover. On the spine it reads: "Benedict Using Harvard Graphics Version 2 for Windows"; stamp that reads: "T 385.B849 1993 Copy 2" and a label that reads "Ft Meade GenColl" and a bar code on the back cover that identifies the Library of Congress, as shown below; published cover of Benedict; title page with a stamp that reads "LIBRARY OF CONGRESS FEB 16 1995", as shown below; verso of the title page (copyright page) that has a handwritten call number that reads: "T385.B459 1993 Copy 2", as shown below: and Contents pages:



36. All identifying characteristics, such as stamps and notations, on Attachment A-1, are consistent with library practice and procedure that I have observed during my career as a professional librarian, specifically with those items held by the Library of Congress. I have no cause for concern about the authenticity or accuracy of these identifying attributes. In addition, Benedict was found within the custody of a library, the Library of Congress, one of the most likely locations for an authentic publication to be located.

37. Evidence of the ownership of Benedict by the Library of Congress will further be explored and detailed in the section below on public access.

38. After comparison between EX1004/1104 and the corresponding pages of Attachment A-1, I found no meaningful difference between the two for purposes of my analysis. Therefore, upon finding Benedict in the Library of Congress I have determined that EX1004/1104, Benedict, is an authentic document.

39. I conclude and affirm that Benedict, EX1004/1104, is an authentic document.

Public Accessibility

40. Attachment A-2 is a true and correct copy of the *WorldCat* entry for Benedict. I obtained Attachment A-2 by completing a search on *WorldCat* on January 26, 2023 by searching District of Columbia (Library of Congress).

41. Attachment A-2 shows that Benedict is the document associated with this *WorldCat* entry, as verified by author: Robert C. Benedict; title: *Using Harvard Graphics Version 2 for Windows;* publisher and publication date: Que in 1993: and ISBN: 1-56529-122-0.

42. Benedict could have been located by searching for the author: Robert C. Benedict; title: *Using Harvard Graphics Version 2 for Windows;* and/or by searching the subject headings: *Harvard graphics for Windows; and/or Presentation graphics software.*

43. When I searched *WorldCat* for holdings of Benedict in the District of Columbia, the Library of Congress was on the list among the 50 libraries shown as holding Benedict worldwide (this number likely would have been higher in the mid/late 1990s and early 2000s when it was newly published, but has, more likely than not been withdrawn from libraries as newer editions were published or the book was deemed out-of-date).

44. The search discussed above could have been performed anywhere in the world by anyone who accessed *WorldCat* and its predecessor database through an OCLC member library in the 1990s through today.

45. Attachment A-3 is a download I made from the Library of Congress OPAC (online catalog) on January 18, 2023. The document cataloged in this record is Benedict as verified by the OPAC record fields including author: Robert C.

Benedict; main title: *Using Harvard Graphics Version 2 for Windows*; and publisher and publication date; Que in 1993 and ISBN: 1-56529-122-0

46. I compared the Library of Congress Classification (call number): T385.B459 1993 with that shown on the bound cover and the verso of the title page (copyright) of Attachment A-1, it is the same.

47. Benedict could have been located in the Library of Congress OPAC by searching for author: Robert C. Benedict: title: : *Using Harvard Graphics Version 2 for Windows;* and/or by searching the subject headings: *Harvard graphics for Windows; and/or Presentation graphics software.*

48. The date stamped on Attachment A-1 of February 28, 1994, as shown below, indicates receipt of Benedict by the Library of Congress, after which it would have been sent to the cataloging department for cataloging and after cataloging was completed Benedict would have been accessible through Library of Congress OPAC.



49. Once Benedict was entered into the general collection of the Library of Congress, members of the public could access the book by having it brought to either

the Jefferson or Adams Reading Rooms. The collections of the Library of Congress are searchable by subject matter, author, or title such that a skilled researcher could find works in which they were interested.

50. Members of the public could read, study, and make notes about a selected work in the Reading Rooms. Further, members of the public were permitted to make photocopies of portions of the work while in the Reading Rooms. Accordingly, a copy of Benedict was accessible to the general public when it was available at the Library of Congress.

51. Attachment A-4 is the MARC record I downloaded from the Library of Congress OPAC on January 18, 2023. The MARC format provides information about the processing and cataloging of Benedict by the Library of Congress. As mentioned above, the 9XX field in the MARC format is allocated to local libraries to enter information specific to that library. The Library of Congress has reserved the 955 field to insert the record of the processing and cataloging of a new acquisition.

52. The MARC 955 field in this record reads –

955 |**a**pb17 03-30-94 to Cat; jf06 to subj 04-26-94; jf04 to S.L. 04-28-94; jf12 05-04-94

53. The 955 MARC field record indicates the processing and cataloging of Benedict began 03-30-94 (March 30, 1994) and was completed on 05-04-94 (May

5, 1994) when full cataloging was completed, and Benedict would have been sent for labeling and to the stacks for shelving.

54. The physical copy of Benedict at the Library of Congress would have been available for public access within one week to ten days after it was cataloged on May 4, 1994 was labelled and transferred to the stacks. Therefore, Benedict would have been accessible to the public no later than May 14, 1994.

Conclusion

55. I conclude that Benedict, EX1004/1104, is an authentic document and would have been publicly accessible no later than May 14, 1994.

Document B: EX1005/1105: David Fox and Troy Downing, *HTML Web Publisher's Construction Kit.* Waite Group Press, 1995. 673 pages. ("Fox")

Authentication

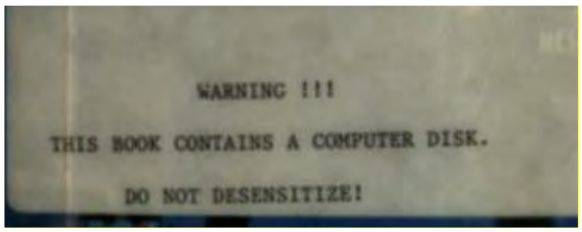
56. I have been asked to opine on a book authored by David Fox and Troy Downing (EX1005/1105) titled *HTML Web Publisher's Construction Kit* ("Fox") published by Waite Group Press in 1995. Fox is comprised of 673 pages that includes: Introduction; Part I – Chapters 1-7; Part II – Chapters 8-19; Part III – Chapters 20-21, A-D; and Index.

57. I have evaluated the Fox reference in two ways: (1) by assessing the digital copy of Fox, EX1005/1105, provided to me by counsel; and (2) by assessing scans of a copy of Fox owned by the State Library of Florida Library (also shown as

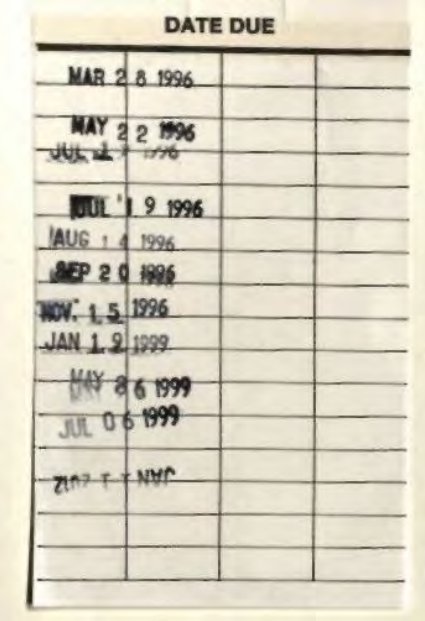
Florida State Library), obtained for me at my request by the Purdue University Libraries Inter Library Loan Department on February 3, 2023, Attachment B-1.

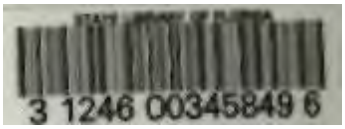
58. EX1005/1105 is a scan of excerpts of a print copy of Fox, provided to me by counsel. I see no evidence that any alteration, inclusion or exclusion of pages, etc., were made during the scanning process. Therefore, more likely than not, this is an accurate scan of Fox, EX1005/1105.

59. Attachment B-1 is a scan provided to me at my request by Purdue University Libraries Inter Library Loan Department on February 3, 2023 from the copy owned by the State Library of Florida. Attachment B-1 front cover with a label that reads "WARNING !!!! THIS BOOK CONTAINS A COMPUTER DISK. DO NOT DESENSITIZE!", as shown below; the bottom edge of Fox that has a stamp that reads: STATE LIBRARY OF FLORIDA', as shown below; inside front cover with a date due slip, that reads: DATE DUE MAR 28 1996 …..", as shown below; title page with a barcode indicating ownership by the Florida State Library, as shown below: verso of the title page (copyright); and Contents: pages VII - XVII









60. All identifying characteristics, such as stamps and notations, on Attachment B-1, are consistent with library practice and procedure that I have observed during my career as a professional librarian. I have no cause for concern about the authenticity or accuracy of these identifying attributes. In addition, Fox was found within the custody of a library, the Florida State Library, a likely location for an authentic publication to be located.

61. Evidence of the ownership of Fox by the Florida State Library will further be explored and detailed in the section below on public access.

62. After comparison between EX1005/1105 and the corresponding pages of Attachment B-1, I found no meaningful difference between the two for purposes of my analysis. Therefore, upon finding Fox in the Florida State Library I have determined that EX1005/1105, Fox, is an authentic document.

63. I conclude and affirm that Fox, EX1005/1105, is an authentic document.

Public Accessibility

64. Attachment B-2 is a true and correct copy of the *WorldCat* entry for Fox. I obtained Attachment B-2 by completing a search on *WorldCat* on February 4, 2023 by searching Florida (Florida State Library).

65. Attachment B-2 shows that Fox is the document associated with this *WorldCat* entry, as verified by authors: David Fox and Troy Downing: title: *HTML Web Publisher's Construction Kit;* publisher and publication date: Waite Group Press in 1995: and ISBN: 1-57169-018-2.

66. Fox could have been located by searching for the authors: David Fox and/or Troy Downing; title: *HTML Web Publisher's Construction Kit;* and/or by searching the subject headings: *HTML; HTML (Document markup language); Hypertext systems;* and/or *Hypertext.*

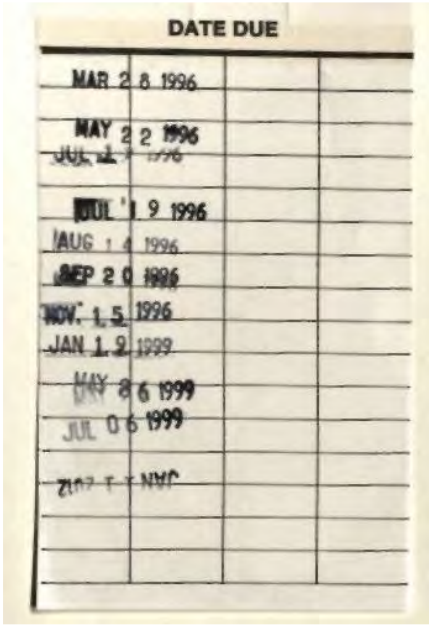
67. When I searched *WorldCat* for holdings of Fox in Florida, State Library of Florida was on the list among the 88 libraries shown as holding Fox worldwide (this number likely would have been higher in the mid/late 1990s and early 2000s when it was newly published, but has, more likely than not been withdrawn from libraries as newer editions were published).

68. The search discussed above could have been performed anywhere in the world by anyone who accessed *WorldCat* and its predecessor database, *FirstSearch*, through an OCLC member library in the 1990s through today.

69. Attachment B-3 is a download I made from the Florida State Library OPAC (online catalog) on January 19, 2023. The document cataloged in this record is Fox as verified by the OPAC record fields including author: David Fox; main title: and *HTML Web Publisher's Construction Kit*.

70. Fox could have been located in the Florida State Library of Florida OPAC by searching for author: David Fox; by title: *HTML Web Publisher's Construction Kit*; and/or by searching the subject headings: *Hypertext systems*; and/or *HTML (Document markup language).*

71. Attachment B-1 includes a date due slip that includes an earliest date due of March 28, 1996, as shown at right. This indicates that this copy of Fox was actually accessed by an interested individual by approximately late February/early March of 1996



(reasonably assuming a 28-day checkout policy[8]). The March 28, 1996 date due stamp is not the date that Fox was received by the Florida State Library nor the date that the book was first available to the public. For example, it is likely that an earlier date due slip was removed and replaced when it became full. The date Fox was received by the Florida State Library will be shown below in the MARC Record, Attachment B-4.

72. Attachment B-4 is the MARC Catalog Record for Fox that I downloaded from the Florida State Library OPAC on January 19, 2023. There are two MARC fields that are informative. First, the 005 (as described above in the introduction) is used by a local library (i.e., Florida State Library) to designate cataloging of the item into its collection, the 005 field in this record reads:

005 19951024080905.0

That is, October 24, 1995.

73. Second, the 948 field (as described above in the introduction) is used by a local library (i.e., Florida State Library) to designate date of cataloging.

948 ‡a 10/24/1995 ‡b 08/10/2002

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[8] *See* https://dos.myflorida.com/library-archives/about-us/about-the-state-library-of-florida/library-policies-and-fees/ ("Most materials check out books for 28 days") (last accessed February 4, 2023).

That is, October 24, 1995. The second date of August 10, 2002, more likely than not, is when an updated library operational system was implemented, and all cataloging data was transferred.

74. Once Fox was entered into the general collection of the Florida State Library it would have been available for public access within one week to ten days after it was cataloged on October 24, 1995, received labelling, and was transferred to the stacks. Therefore, Fox would have been accessible to the public, more likely than not, no later than November 3, 1995.

Conclusion

75. I conclude that Fox, EX1005/1105, is an authentic document and would have been publicly accessible no later than November 3, 1995.

Document C: EX1006/1106: Stephen S. Sagman. *Running Microsoft PowerPoint4 for Windows.* Microsoft Press, 1994. Pages 464 pages. ("Sagman")

Authentication

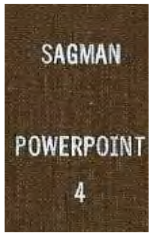
76. I have been asked to opine for a book titled, *Running Microsoft PowerPoint4 for Windows* authored by Stephen S. Sagman. Sagman was published in 1994 by Microsoft Press. It contains in pages numbered 1 through 464; 18 Chapters; Appendix and an Index.

77. I have evaluated the Sagman reference in two ways: (1) by assessing the digital copy of Sagman, EX1006/1106, provided to me by counsel; and (2) by assessing scans of a copy of Sagman owned by the Library of Congress, that I

requested through the Wisconsin TechSearch (WTS) that I received on January 19, 2023, Attachment C-1.

78. EX1006/1106 is a scan of excerpts from a print copy of Sagman, provided to me by counsel. I see no evidence that any alteration or inclusion of pages, etc., were made during the scanning process. The pages follow-on to each other as expected, therefore, more likely than not, this is an accurate scan of Sagman.

79. Attachment C-1 is a scan provided to me by the Wisconsin Tech Search (WTS) obtained from the copy owned by the Library of Congress. Attachment C-1 includes: bound front, spine, and back cover. On the spine it reads: "Sagman PowerPoint 4"; a label that reads "Landover GenColl" and stamp that reads: "QA76.76.W45 S24 1994" and a bar code on the back cover that identifies the Library of Congress, as shown below; published cover of Sagman; title page; verso of the title page (copyright page) that has a handwritten call number that reads: "QA76.76.W56S24 1994" and a stamp that reads, "LIBRARY OF CONGRESS May 3, 1994", as shown below, and Contents pages:











80. All identifying characteristics, such as stamps and notations, on Attachment C-1, are consistent with library practice and procedure that I have observed during my career as a professional librarian, specifically with those items held by the Library of Congress. I have no cause for concern about the authenticity or accuracy of these identifying attributes. In addition, Sagman was found within the custody of a library, the Library of Congress, one of the most likely locations for an authentic publication to be located.

81. Evidence of the ownership of Sagman by the Library of Congress will further be explored and detailed in the section below on public access.

82. After comparison between EX1006/1106 and the corresponding pages of Attachment C-1, I found no meaningful difference between the two for purposes of my analysis. Therefore, upon finding Sagman in the Library of Congress I have determined that EX1006/1106, Sagman, is an authentic document.

83. I conclude and affirm that Sagman, EX1006/1106, is an authentic document.

Public Accessibility

84. Attachment C-2 is a true and correct copy of the *WorldCat* entry for Sagman. I obtained Attachment C-2 by completing a search on *WorldCat* on January 26, 2023 by searching District of Columbia (Library of Congress).

85. Attachment C-2 shows that Sagman is the document associated with this *WorldCat* entry, as verified by author: Stephen W. Sagman; title: *Running Microsoft PowerPoint 4 for Windows;* publisher and publication date: Microsoft Press in 1994: and ISBN: 1-55615-639-1.

86. Sagman could have been located by searching for the author: Stephen W. Sagman; title: *Running Microsoft PowerPoint 4 for Windows;* and/or by searching the subject headings: *Computers (Software) Microsoft;* and/or *PowerPoint (Computer file).*

87. When I searched *WorldCat* for holdings of Sagman in the District of Columbia, the Library of Congress was on the list among the 126 libraries shown as holding Sagman worldwide (this number likely would have been higher in the mid/late 1990s and early 2000s when it was newly published, but has, more likely than not been withdrawn from libraries as newer editions were published or the book was deemed out-of-date).

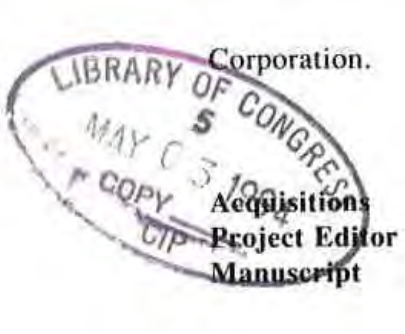
88. The search discussed above could have been performed anywhere in the world by anyone who accessed *WorldCat* and its predecessor database through an OCLC member library in the 1990s through today.

89. Attachment C-3 is a download I made from the Library of Congress OPAC (online catalog) on January 18, 2023. The document cataloged in this record is Sagman as verified by the OPAC record fields including author: Stephen W. Sagman; main title; *Running Microsoft PowerPoint 4 for Windows* and publisher and publication date: Microsoft Press in 1994 and ISBN: 1-55615-639-1.

90. I compared the Library of Congress Classification (call number): QA76.76.W56S24 1994 with that shown on the bound cover and the verso of the title page (copyright) of Attachment C-1, it is the same.

91. Sagman could have been located in the Library of Congress OPAC by searching for author: Stephen W. Sagman: title: *Running Microsoft PowerPoint 4 for Windows;* and/or by searching the subject headings: *Computers (Software) Microsoft;* and/or *PowerPoint (Computer file).*

92. The date stamped on Attachment C-1 of May 3, 1994, as shown below, indicates receipt of Sagman by the Library of Congress, after which it would have been sent to the cataloging department for cataloging and after cataloging was completed Sagman would have been accessible through Library of Congress OPAC.



93. Once Sagman was entered into the general collection of the Library of Congress, members of the public could access the book by having it brought to either the Jefferson or Adams Reading Rooms. The collections of the Library of Congress are searchable by subject matter, author, or title such that a skilled researcher could find works in which they were interested.

94. Members of the public could read, study, and make notes about a selected work in the Reading Rooms. Further, members of the public were permitted to make photocopies of portions of the work while in the Reading Rooms. Accordingly, a copy of Sagman was accessible to the general public when it was available at the Library of Congress.

95. Attachment C-4 is the MARC record I downloaded from the Library of Congress OPAC on January 18, 2023. The MARC format provides information about the processing and cataloging of Sagman by the Library of Congress. As mentioned above, the 9XX field in the MARC format is allocated to local libraries to enter information specific to that library. The Library of Congress has reserved

the 955 field to insert the record of the processing and cataloging of a new acquisition.

96. The MARC 955 field in this record reads –

> 955 __ |**a** pc18 to ja00 01-10-94; jf06 to subj 01-10-94; jf11 to sl 01-10-94; jf12 01-11-94; bk recd jd00 05-06-94; CIP ver jd13 05-11-94

97. The 955 MARC field record indicates the manuscript was received for preliminary Cataloging in Publication (CIP) processing on 01-10-94 (January 10, 1994), it was then sent to various cataloging department for assignment of subject and classification that process ended on 01-11-94 (January 11, 1994); the published book was received on 05-06-94 (May 6, 1994) and cataloging of Sagman was completed on 05-11-94 (May 11, 1994), and Sagman would have been sent for labeling and to the stacks for shelving.

98. The physical copy of Sagman at the Library of Congress would have been available for public access within one week to ten days after it was cataloged on May 5, 1994 was labelled and transferred to the stacks. Therefore, Sagman would have been accessible to the public no later than May 15, 1994.

Conclusion

99. I conclude that Sagman, EX1006/1106, is an authentic document and would have been publicly accessible no later than May 15, 1994.

Document D: EX1008/1108: Catherine Guinan and Alan F. Smeaton. "Information Retrieval from Hypertext Using Dynamically Planned Guided Tours." ***Proceedings of the ACM Conference on Hypertext*****, Milano, Italy,**

November 30 – December 6, 1992. Association of Computing Machinery. pp. 122-130. ("Guinan")

Authentication

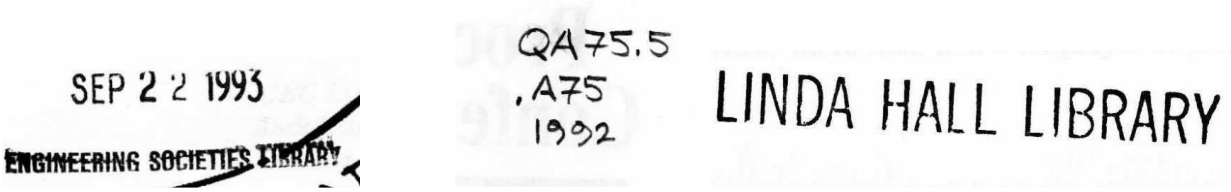
100. I have been asked to opine on the authenticity and public access of an article, EX1008/1108, authored by Catherine Guinan and Alan F. Smeaton, "Information Retrieval from Hypertext Using Dynamically Planned Guided Tours" published in the *Proceedings of the ACM Conference on Hypertext*, Milano, Italy, November 30 – December 6, 1992. Association of Computing Machinery on pages 122-130. ("Guinan")

101. For consistency and clarification, Guinan, when used in this declaration, refers not only to the Guinan article but also the *Proceedings of the ACM Conference on Hypertext,* Milano, Italy, November 30 – December 6, 1992.

102. I have evaluated the Guinan reference in three ways: (1) by assessing scans of a copy of Guinan (EX1008/1108) provided to me by counsel; (2) accessing and assessing a scan of Guinan, Attachment D-1, I obtained through Document Services of the Linda Hall Library from the print copy of Guinan owned by the Linda Hall Library, Kansas City, Missouri, a pre-eminent research library in the areas of science, engineering and technology on January 23, 2023; and (3) by retrieving and reviewing a download, Attachment D-2, I made on January 30, 2023 through Purdue University Libraries by my emeritus faculty status from *ACM Digital Library*, a proprietary database through this URL: https://dl-acm-

org.ezproxy.lib.purdue.edu/doi/abs/10.1145/168466.168506 Guinan is available for a fee at this URL: https://dl.acm.org/doi/pdf/10.1145/168466.168506

103. Attachment D-1 is a scan of Guinan that includes the book cover of ACM Conference Proceedings, Hypertext '92: Conference Proceedings, Milan Italy, November 30-December 4, 1992: title page with a date stamp that reads "SEP 22 1993 Engineering Societies Library", as shown below; title page with a handwritten call number that reads "QA75.5.A75 1992", as shown below; Conference Organization with a stamp that reads "Linda Hall Library", as shown below; Contents; and Guinan article on pages 122-130.



104. All identifying characteristics, such as the stamp on Attachment D-1 are consistent with library practice and procedure that I have observed during my career as a professional librarian. I have no cause for concern about the authenticity or accuracy of these identifying attributes. Attachment D-1 was found within the custody of a library, the Linda Hall Library, one of the most likely locations for an authentic publication.

105. Attachment D-2 is a copy of Guinan that I retrieved on January 30, 2023, from *ACM Digital Library* through the Purdue University Libraries by my

emeritus faculty status: https://dl-acm-org.ezproxy.lib.purdue.edu/doi/abs/10.1145/168466.168506 Guinan is available for a fee at this URL: https://dl.acm.org/doi/pdf/10.1145/168466.168506

106. After comparing Guinan as it appeared in EX1008/1108, Attachment D-1, and Attachment D-2, I conclude, based on finding Guinan in print in a library – Linda Hall - and online through a reputable, publisher database, *ACM Digital Library,* that Guinan is an authentic document, and that EX1008/1108, Attachment D-1, and Attachment D-2 are authentic and accurate copies of Guinan.

107. Therefore, I conclude and affirm Guinan, EX1008/1108, is an authentic document.

Public Accessibility

108. Attachment D-3 is a true and correct copy of the *WorldCat* entry for Guinan that I downloaded and captured on January 30, 2023. Guinan was included among the articles published in *Proceedings of the ACM Conference on Hypertext*, Milano, Italy, November 30 – December 6, 1992. I obtained Attachment D-3 by completing a search on *WorldCat* on January 30, 2023. The document cataloged in the record is a record for *Proceedings of the ACM Conference on Hypertext*, Milano, Italy, November 30 – December 6, 1992.

109. When undertaking the search of *WorldCat* as described above using the geographical location of Missouri, the Linda Hall Library was among the 29 libraries

that hold *Proceedings of the ACM Conference on Hypertext*, Milano, Italy, November 30 – December 6, 1992.

110. Attachment D-4 is a download I made from the Linda Hall Library OPAC (online catalog) on January 23, 2023. The document cataloged in this record is the OPAC record for *Proceedings of the ACM Conference on Hypertext*, Milano, Italy, November 30 – December 6, 1992.

111. Guinan could have been located by searching on the Linda Hall Library OPAC (online catalog) for the title: *Proceedings of the ACM Conference on Hypertext*, Milano, Italy, November 30 – December 6, 1992 or by searching the subject heading*: Hypertext systems; and/or Interactive multimedia.*

112. On Attachment D-1 is the date stamp on the title page that reads "SEP 22 1993", as shown below; and the library ownership stamp on the Conference Organization page, as shown below. The date of September 22, 1993 would be when receipt and the processing began on *Proceedings of the ACM Conference on Hypertext*, Milano, Italy, November 30 – December 6, 1992 (Guinan). Consistent with standard library policy and practice, this issue would have been accessible within a week to ten days after receipt, that is, no later than October 3, 1993.



Conclusion

113. I conclude that Guinan, EX1008/1108, is an authentic document and would have been publicly accessible through the Linda Hall Library no later than October 3, 1993.

Document E: EX1010/1110: Michael Miller. *Using CompuServe, Second Edition.* Que, 1994. 524 pages. ("Miller")

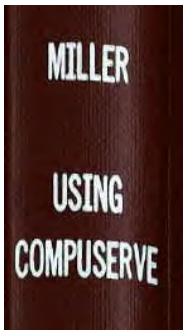
Authentication

114. I have been asked to opine for a book titled *Using CompuServe, Second Edition* authored by Michael Miller. Miller was published in 1994 by Que. It contains in 494 pages numbered 1 through 494: Introduction; 40 Chapters; and an Index.

115. I have evaluated the Miller reference in two ways: (1) by assessing the digital copy of Miller, EX1010/1110, provided to me by counsel; and (2) by assessing scans of a copy of Miller owned by the Library of Congress, that I requested through the Wisconsin TechSearch (WTS) that I received on January 19, 2023, Attachment E-1.

116. EX1010/1110 is a scan of excerpts from a print copy of Miller, provided to me by counsel. I see no evidence that any alteration or inclusion of pages, etc., were made during the scanning process. The pages follow-on to each other as expected, therefore, more likely than not, this is a complete and accurate scan of Miller.

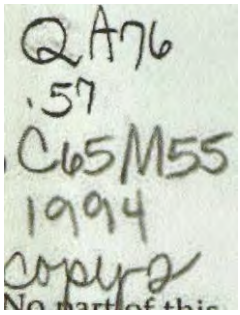
117. Attachment E-1 is a scan provided to me by the Wisconsin Tech Search (WTS) obtained from the copy owned by the Library of Congress. Attachment E-1 includes: bound front, spine, and back cover. On the spine it reads: "Miller Using CompuServe"; label that reads "FT Meade GenColl; stamp that reads: "QA76.57 C65 M55 1994 Copy 2" and a bar code on the back cover that identifies the Library of Congress, all are shown below; published cover of Miller; title page; verso of the title page (copyright page) that has a handwritten call number that reads: "QA76.57.C65M55 1994 Copy 2", with a stamp that reads "LIBRARY OF CONGRESS JAN 17 1995" all shown below; Contents pages: and published back cover.











118. All identifying characteristics, such as stamps and notations, on Attachment E-1, are consistent with library practice and procedure that I have observed during my career as a professional librarian, specifically with those items held by the Library of Congress. I have no cause for concern about the authenticity or accuracy of these identifying attributes. In addition, Miller was found within the custody of a library, the Library of Congress, one of the most likely locations for an authentic publication to be located.

119. Evidence of the ownership of Miller by the Library of Congress will further be explored and detailed in the section below on public access.

120. After comparison between EX1010/1110 and the corresponding pages of Attachment E-1, I found no meaningful difference between the two for purposes of my analysis. Therefore, upon finding Miller in the Library of Congress I have determined that EX1010/1110, Miller, is an authentic document

121. I conclude and affirm that Miller, EX1010/1110, is an authentic document.

Public Accessibility

122. Attachment E-2 is a true and correct copy of the *WorldCat* entry for Miller. I obtained Attachment E-2 by completing a search on *WorldCat* on January 28, 2023 by searching District of Columbia (Library of Congress).

123. Attachment E-2 shows that Miller is the document associated with this *WorldCat* entry, as verified by author: Michael Miller; title: *Using CompuServe, 2d Ed;* publisher and publication date: Que in 1994; and ISBN: 0-7897-0079-4.

124. Miller could have been located by searching for the author: Michael Miller; title: *Using CompuServe;* and/or by searching the subject headings: *CompuServe (Online service)* and/or *CompuServe (Serveur).*

125. When I searched *WorldCat* for holdings of Miller in the District of Columbia, the Library of Congress was on the list among the 53 libraries shown as holding Miller worldwide (this number likely would have been higher in the mid/late 1990s and early 2000s when it was newly published, but has, more likely than not been withdrawn from libraries as newer editions were published or the book was deemed out-of-date).

126. The search discussed above could have been performed anywhere in the world by anyone who accessed *WorldCat* and its predecessor database through an OCLC member library in the 1990s through today.

127. Attachment E-3 is a download I made from the Library of Congress OPAC (online catalog) on January 18, 2023. The document cataloged in this record is Miller as verified by the OPAC record fields including author: Michael Miller; main title: *Using CompuServe, 2d Ed*; and publisher and publication date: Que in 1994 and ISBN: 0-7897-0079-4.

128. I compared the Library of Congress Classification (call number): QA76.57.C65 M55 1994 with that shown on the bound cover and the verso of the title page (copyright) of Attachment E-1, it is the same.

129. Miller could have been located in the Library of Congress OPAC by searching for author: Michael Miller: title: *Using CompuServe, 2d Ed;* and/or by searching the subject heading: *CompuServe (Online service)*

130. The date stamped on Attachment E-1 of January 17, 1995, as shown below, indicates receipt of Miller by the Library of Congress, after which it would have been sent to the cataloging department for cataloging and after cataloging was completed Miller would have been accessible through Library of Congress OPAC.



131. Once Miller was entered into the general collection of the Library of Congress, members of the public could access the book by having it brought to either the Jefferson or Adams Reading Rooms. The collections of the Library of Congress are searchable by subject matter, author, or title such that a skilled researcher could find works in which they were interested.

132. Members of the public could read, study, and make notes about a selected work in the Reading Rooms. Further, members of the public were permitted to make photocopies of portions of the work while in the Reading Rooms. Accordingly, a copy of Miller was accessible to the general public when it was available at the Library of Congress.

133. Attachment E-4 is the MARC record I downloaded from the Library of Congress OPAC on January 18, 2023. The MARC format provides information about the processing and cataloging of Miller by the Library of Congress. As mentioned above, the 9XX field in the MARC format is allocated to local libraries

to enter information specific to that library. The Library of Congress has reserved the 955 field to insert the record of the processing and cataloging of a new acquisition.

134. The MARC 955 field in this record reads –

955 __ |**a** pb18 04-10-95 to cat.;jf00 04-12-95; jf11 to sl 04-21-95;jf12 05-09-95

135. The 955 MARC field record indicates the processing and cataloging of Miller began on 04-10-95 (April 10, 1995) and was completed on 05-09-95 (May 9, 1995) when full cataloging was completed. Once cataloging was completed, Miller would have been sent for labeling and to the stacks for shelving.

136. The physical copy of Miller at the Library of Congress would have been available for public access within one week to ten days after it was cataloged on May 9, 1995 was labelled and transferred to the stacks. Therefore, Miller would have been accessible to the public no later than May 19, 1995.

Conclusion

137. I conclude that Miller, EX1010/1110, is an authentic document and would have been publicly accessible no later than May 19, 1995.

Document F: EX1012/1112: Ernest Ackermann, et al., U*sing UNIX, Special Edition.* Que, 1994. 963 pages. ("Ackermann")

Authentication

138. I have been asked to opine for a book titled *Using UNIX, Special Edition.* authored by Ernest Ackermann, et al. Ackermann was published in 1994

by Que. It contains in 963 pages numbered 1 through 963: Introduction; [Sections numbered] I – IX; Appendix, and an Index.

139. I have evaluated the Ackermann reference in two ways: (1) by assessing the digital copy of Ackermann, EX1012/1112, provided to me by counsel; and (2) by assessing scans of a copy of Ackermann owned by the Library of Congress, that I requested through the Wisconsin TechSearch (WTS) that I received on January 23, 2023, Attachment F-1.

140. EX1012/1112 is a scan of excerpts from the print copy of Ackermann, provided to me by counsel. I see no evidence that any alteration or inclusion of pages, etc., were made during the scanning process. The pages follow-on to each other as expected, therefore, more likely than not, this is an accurate scan of Ackermann.

141. Attachment F-1 is a scan provided to me by the Wisconsin Tech Search (WTS) obtained from the copy owned by the Library of Congress. The attachment F-1 includes: bound front, spine, and back cover. On the spine it reads: "Using UNIX Special Edition; a label that reads "FT MEADE GenColl" and a stamp that reads "QA 76.76.O63 U74 1994", and a bar code on the back cover that identifies the Library of Congress, all are shown below; published cover of Ackermann; title page with a stamp that reads "LIBRARY OF CONGRESS JUL 15 1994"; verso of

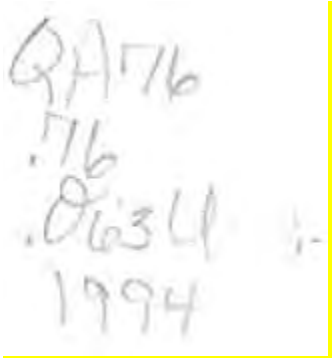
the title page (copyright page) that has a handwritten call number that reads: "QA 76.76.O63 U74 1994", all shown below; Contents pages: and published back cover.











142. All identifying characteristics, such as stamps and notations, on Attachment F-1, are consistent with library practice and procedure that I have observed during my career as a professional librarian, specifically with those items held by the Library of Congress. I have no cause for concern about the authenticity or accuracy of these identifying attributes. In addition, Ackermann was found within

the custody of a library, the Library of Congress, one of the most likely locations for an authentic publication to be located.

143. Evidence of the ownership of Ackermann by the Library of Congress will further be explored and detailed in the section below on public access.

144. After comparison between EX1012/1112 and the corresponding pages of Attachment F-1, I found no difference between the two. Therefore, upon finding Ackermann in the Library of Congress I have determined that EX1012/1112, Ackermann, is an authentic document.

145. I conclude and affirm that Ackermann, EX1012/1112, is an authentic document.

Public Accessibility

146. Attachment F-2 is a true and correct copy of the *WorldCat* entry for Ackermann. I obtained Attachment F-2 by completing a search on *WorldCat* on January 28, 2023 by searching District of Columbia (Library of Congress).

147. Attachment F-2 shows that Ackermann is the document associated with this *WorldCat* entry, as verified by author: Ernest C. Ackermann; title: *Using UNIX;* publisher and publication date: Que in 1994; and ISBN: 1-56529-619-2.

148. Ackermann could have been located by searching for the author: Ernest C. Ackermann; title: *Using UNIX;* and/or by searching the subject heading: *UNIX (Computer file).*

149. When I searched *WorldCat* for holdings of Ackermann in the District of Columbia, the Library of Congress was on the list among the 111 libraries shown as holding Ackermann worldwide (this number likely would have been higher in the mid/late 1990s and early 2000s when it was newly published, but has, more likely than not been withdrawn from libraries as newer editions were published or the book was deemed out-of-date).

150. The search discussed above could have been performed anywhere in the world by anyone who accessed *WorldCat* and its predecessor database through an OCLC member library in the 1990s through today.

151. Attachment F-3 is a download I made from the Library of Congress OPAC (online catalog) on January 23, 2023. The document cataloged in this record is Ackermann as verified by the OPAC record fields including author: Ernest C. Ackermann; main title: *Using UNIX*; and publisher and publication date: Que in 1994 and ISBN: 1-56529-619-2

152. I compared the Library of Congress Classification (call number): QA76.76.O63 U74 1994 with that shown on the bound cover and the verso of the title page (copyright) of Attachment F-1, it is the same.

153. Ackermann could have been located in the Library of Congress OPAC by searching for author: Ernest C. Ackermann; title: *Using UNIX;* and/or by searching the subject heading: *UNIX (Computer file)*.

154. The date stamped on Attachment F-1 of July 18, 1994, as shown below, indicates receipt of Ackermann by the Library of Congress, after which it would have been sent to the cataloging department for cataloging and after cataloging was completed Ackermann would have been accessible through Library of Congress OPAC.



155. Once Ackermann was entered into the general collection of the Library of Congress, members of the public could access the book by having it brought to either the Jefferson or Adams Reading Rooms. The collections of the Library of Congress are searchable by subject matter, author, or title such that a skilled researcher could find works in which they were interested.

156. Members of the public could read, study, and make notes about a selected work in the Reading Rooms. Further, members of the public were permitted to make photocopies of portions of the work while in the Reading Rooms. Accordingly, a copy of Ackermann was accessible to the general public when it was available at the Library of Congress.

157. Attachment F-4 is the MARC record I downloaded from the Library of Congress OPAC on January 23, 2023. The MARC format provides information about the processing and cataloging of Ackermann by the Library of Congress. As mentioned above, the 9XX field in the MARC format is allocated to local libraries to enter information specific to that library. The Library of Congress has reserved the 955 field to insert the record of the processing and cataloging of a new acquisition.

158. The MARC 955 field in this record reads –

955 __ |**a** pn08 03-11-94; jf00 09-07-94; jf06 to subj 09-13-94; jf11 to sl 09-19-94; jf12 09-21-94 to ddc; aa20 9-27-94

159. The 955 MARC field record indicates the processing and cataloging of Ackermann began on 03-11-94 (March 11, 1994) for Cataloging in Publication (CIP) and after the published copy of Ackermann was received on July 18, 1994 (as shown in the stamp on Attachment F-1) was completed on 9-27-94 (September 27, 1994) when full cataloging was completed. Once cataloging was completed, Ackermann would have been sent for labeling and to the stacks for shelving. .

160. The physical copy of Ackermann at the Library of Congress would have been typically available for public access within one week to ten days after it was cataloged on September 27, 1994 was labelled and transferred to the stacks. Therefore, Ackermann would have been accessible to the public no later than October 7, 1994.

Conclusion

161. I conclude that Ackermann, EX1012/1112, is an authentic document and would have been publicly accessible, more likely than not, no later than October 7, 1994.

Document G: EX1013/1113: *Microsoft Office for Windows 95 Resource Kit : the Technical Resource for Installing, Configuring, and Supporting Microsoft Office for Windows 95, Professional Edition.* Microsoft Press, 1995. 940 pages. ("Microsoft")

Authentication

162. I have been asked to opine for a book titled *Microsoft Office for Windows 95 Resource Kit : the Technical Resource for Installing, Configuring, and Supporting Microsoft Office for Windows 95, Professional Edition* published in 1995 by Microsoft Press. It contains in 940 pages numbered 1 through 940: Chapters 1-20; and Appendices A-F.

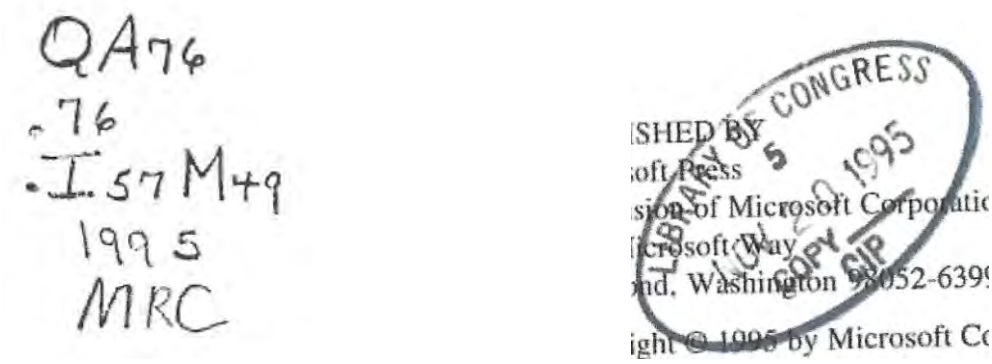
163. I have evaluated the Microsoft reference in two ways: (1) by assessing the digital copy of Microsoft, EX1013/1113, provided to me by counsel; and (2) by assessing scans of a copy of Microsoft owned by the Library of Congress, that I requested through the Wisconsin TechSearch (WTS) that I received on January 23, 2023, Attachment G-1.

164. EX1013/1113 is a scan of excerpts from a print copy of Microsoft, scanned and provided to me by counsel. I see no evidence that any alteration or inclusion of pages, etc., were made during the scanning process. The pages follow-

on to each other as expected, therefore, more likely than not, this is an accurate scan of Microsoft.

165. Attachment G-1 is a scan provided to me by the Wisconsin Tech Search (WTS) obtained from the print copy owned by the Library of Congress. Attachment G-1 includes: bound front, spine, and back cover. On the spine it reads: "Microsoft Office for Windows 95 Resource Kit"; a stamp that reads "QA76.76.I57 M49 1995"; and a bar code on the back cover that identifies the Library of Congress, all are shown below; published cover of Microsoft; title page; verso of the title page (copyright page) that has a handwritten call number that reads: "QA76.76.I57 M49 1995 MRC", with a stamp that reads "LIBRARYY OF CONGRESS NOV 20 1995" all shown below; Contents pages; and published cover.





166. All identifying characteristics, such as stamps and notations, on Attachment G-1, are consistent with library practice and procedure that I have observed during my career as a professional librarian, specifically with those items held by the Library of Congress. I have no cause for concern about the authenticity or accuracy of these identifying attributes. In addition, Microsoft was found within the custody of a library, the Library of Congress, one of the most likely locations for an authentic publication to be located.

167. Evidence of the ownership of Microsoft by the Library of Congress will further be explored and detailed in the section below on public access.

168. After comparison between EX1013/1113 and the corresponding pages of Attachment G-1, I found no meaningful difference between the two for purposes of my analysis. Therefore, upon finding Microsoft in the Library of Congress I have determined that EX1013/1113, Microsoft, is an authentic document.

169. I conclude and affirm that Microsoft, EX1013/1113, is an authentic document.

Public Accessibility

170. Attachment G-2 is a true and correct copy of the *WorldCat* entry for Microsoft. I obtained Attachment G-2 by completing a search on *WorldCat* on January 28, 2023 by searching District of Columbia (Library of Congress).

171. Attachment G-2 shows that Microsoft is the document associated with this *WorldCat* entry, as verified by title: *Using UNIX;* publisher and publication date: Que in 1995.

172. Microsoft could have been located by searching for the author: title: *Using UNIX;* and/or by searching the subject headings: *Integrated software; Microsoft Windows (Computer file); Software Application Programs applications*; and/or *Computer software*.

173. When I searched *WorldCat* for holdings of Microsoft in the District of Columbia, the Library of Congress was on the list among the 78 libraries shown as holding Microsoft worldwide (this number likely would have been higher in the mid/late 1990s and early 2000s when it was newly published, but has, more likely than not been withdrawn from libraries as newer editions were published or the book was deemed out-of-date).

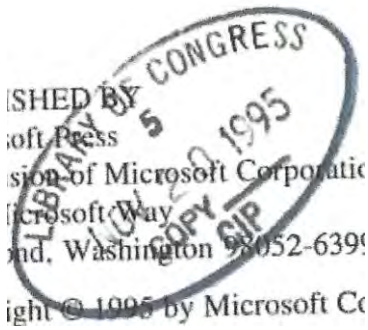
174. The search discussed above could have been performed anywhere in the world by anyone who accessed *WorldCat* and its predecessor database through an OCLC member library in the 1990s through today.

175. Attachment G-3 is a download I made from the Library of Congress OPAC (online catalog) on January 23, 2023. The document cataloged in this record is Microsoft as verified by the OPAC record fields including title: *Using UNIX*; and publisher and publication date: Que in 1995.

176. I compared the Library of Congress Classification (call number): QA76.76 .I57 M49 1995 with that shown on the bound cover and the verso of the title page (copyright) of Attachment G-1, it is the same with the exception of MRC which is a shelving location.

177. Microsoft could have been located in the Library of Congress OPAC by searching for title: *Using UNIX;* and/or by searching the subject heading: *Microsoft Office; Microsoft Windows (Computer file);* and/or *Integrated software.*

178. The date stamped on Attachment G-1 of November 20, 1995, as shown below, indicates receipt of Microsoft by the Library of Congress, after which it would have been sent to the cataloging department for cataloging and after cataloging was completed Microsoft would have been accessible through Library of Congress OPAC.



179. Once Microsoft was entered into the general collection of the Library of Congress, members of the public could access the book by having it brought to either the Jefferson or Adams Reading Rooms. The collections of the Library of Congress are searchable by subject matter or title such that a skilled researcher could find works in which they were interested.

180. Members of the public could read, study, and make notes about a selected work in the Reading Rooms. Further, members of the public were permitted to make photocopies of portions of the work while in the Reading Rooms. Accordingly, a copy of Microsoft was accessible to the general public when it was available at the Library of Congress.

181. Attachment G-4 is the MARC record I downloaded from the Library of Congress OPAC on January 23, 2023. The MARC format provides information about the processing and cataloging of Microsoft by the Library of Congress. As mentioned above, the 9XX field in the MARC format is allocated to local libraries to enter information specific to that library. The Library of Congress has reserved the 955 field to insert the record of the processing and cataloging of a new acquisition.

182. The MARC 955 field in this record reads

955__ |**a** pc20 to ja00 07-28-95; jf03 to Comp. Files 07-28-95; jf03 to Subj. 08-01-95; jf11 to sl 08-01-95; jf14 08-03-95; CIP ver. pv08 12-04-95

183. The 955 MARC field record indicates the processing and cataloging of Microsoft began on 07-28-95 (July 28, 1994) for Cataloging in Publication (CIP) and after the published copy of Microsoft was received on November 20, 1995 (as shown in the stamp on Attachment G-1) was completed on 12-04-1995 (December 4, 1995) when full cataloging was completed. Once cataloging was completed, Microsoft would have been sent for labeling and to the stacks for shelving.

184. The physical copy of Microsoft at the Library of Congress would have been available for public access within one week to ten days after it was cataloged on May 9, 1995 was labelled and transferred to the stacks. Therefore, Microsoft would have been accessible to the public no later than November 30,1995.

Conclusion

185. I conclude that Microsoft, EX1013/1113, is an authentic document and would have been publicly accessible no later than November 30, 1995.

V. AVAILABILITY FOR CROSS-EXAMINATION

186. In signing this Declaration, I recognize that this Declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the U.S. Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

VI. RIGHT TO SUPPLEMENT

187. I reserve the right to supplement my opinions in the future to respond to any arguments that the Patent Owner raises and to take into account new information as it becomes available to me.

VII. JURAT

188. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the full knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the U.S. Code.

Dated: February 4, 2023

James L. Mullins, PhD
Williamsburg, VA

APPENDIX A

JAMES L. MULLINS, PhD

Prior Art Documentation Librarian Services, LLC

205 Saint Cuthbert, Williamsburg, VA 23188

jlmullins@priorartdoclib.com

ph. 765 479 4956

Prior Art Documentation Librarian Services, LLC. (PADLS). Founded January 2018. As of January, 2023, 1 have completed 115 declarations for 37 law firms; four depositions were scheduled, three cancelled a few days prior, and only one was held in February, 2019.

Library Experience:

2018-present Dean Emeritus, Libraries & Norton Professor Emeritus, Purdue University

2011 - 2017 Dean of Libraries & Esther Ellis Norton Professor, Purdue University

2004 - 2011 Dean of Libraries & Professor, Purdue University, West Lafayette, IN

2000-2004 Assistant/Associate Director for Administration, MIT Libraries, Massachusetts Institute of Technology, Cambridge, MA.

1996-2000 University Librarian & Director, Falvey Memorial Library. Villanova University, Villanova, PA.

1978-1996 Director of Library Services, Indiana University South Bend.

1974-1978 Associate Librarian, Indiana University Bloomington, School of Law.

1973-1974 Instructor/Catalog Librarian. Georgia Southern College (now University).

Teaching Experience:

1977-1996 Associate Professor (part-time), School of Library and Information Science, Indiana University. Subjects taught: Cataloging, Management, and Academic Librarianship.

Education:

1972 - University of Iowa. Honors Bachelor of Arts, History, Religion & Political Science.

1973 - University of Iowa. Master of Arts in Library Science.

1984 - Indiana University. Doctor of Philosophy. Concentration: Academic Library Administration. Emphasis: Law Librarianship.

Awards and Recognition:

2017 Wilmeth Active Learning Center/Library of Engineering and Science, Grand Reading Room, was announced by President Mitch Daniels, Purdue University, that it would be re-named the James L. Mullins Reading Room to honor his leadership and reputation in the academic library profession. September 2017. Portrait unveiled December 2017.

2017 Distinguished Alumnus Award by the School of Informatics and Computing, Indiana University, Bloomington. Given June 25, 2017.

2016 Hugh C. Atkinson Memorial Award, jointly sponsored by the four divisions of the American Library Association (ALA), June 27, 2016.

2015 ACRL Excellence in University Libraries Award, April 23, 2015.

Named Esther Ellis Norton Professor of Library Science by Purdue Trustees, December 11, 2011.

International Review Panel to evaluate the University of Pretoria Library, February 20 – 24, 2011. Pretoria, South Africa.

Publications: (selected)

Designing the Academic Library, Chapter Contributor. Association of College and Research Libraries, American Library Association, 2022.

A Purdue Icon: Creation, Life, and Legacy, edited by James L. Mullins, Founder's Series, Purdue University Press, 138pp., August 2017.

"The policy and institutional framework." In *Research Data Management, Practical Strategies for Information Professionals,* edited by Ray, J M. Purdue University Press, pp.25-44, 2014.

"DataCite: linking research to data sets and content." In Benson, P and Silver, S. *What Editors Want: An Author's Guide to Scientific Journal Publishing*. University of Chicago Press, pp. 21-23, December 2012.

"Library Publishing Services: Strategies for Success," with R. Crow, O. Ivins, A. Mower, C. Murray-Rust, J. Ogburn, D Nesdill, M. Newton, J. Speer, C. Watkinson. *Scholarly Publishing and Academic Resources Coalition (SPARC),* version 2.0, March 2012.

"The Changing Definition and Role of Collections and Services in the University Research Library." *Indiana Libraries,* Vol 31, Number 1 (2012), pp.18-24.

"Are MLS Graduates Being Prepared for the Changing and Emerging Roles that Librarians must now assume within Research Libraries?" *Journal of Library Administration.* Volume 52, Issue 1, 2012, p. 124-132

Baykoucheva, Svetla. What Do Libraries Have to Do with e-Science?: An Interview with James L. Mullins, Dean of Purdue University Libraries. Chem. Inf. Bull. [Online] 2011, 63 (1), 45-49. http://www.acscinf.org/publications/bulletin/63-1/mullins.php (accessed Mar 16, 2011).

"The Challenges of e-Science Data-set Management and Scholarly Communication for Domain Sciences and Technology: a Role for Academic Libraries and Librarians," chapter in, *The Digital Deluge: Can Libraries Cope with e-Science?"* Deanna B. Marcum and Gerald George, editors, Libraries Unlimited/Teacher Ideas Press, 2009. (a monograph publication of the combined proceedings of the KIT/CLIR proceedings).

"Bringing Librarianship to e-Science," *College and Research Libraries.* vol. 70, no. 3, May 2009, editorial.

"The Librarian's Role in e-Science" *Joho Kanri (Journal on Information Processing and Management),* Japan Science and Technology Agency (formerly Japan Information Center of Science and Technology), Tokyo, Japan. Translated into Japanese by Taeko Kato. March 2008.

The Challenge of e-Science Data-set Management to Domain Sciences and Engineering: a Role for Academic Libraries and Librarians," KIT (Kanazawa Institute of Technology)/CLIR (Council of Library and Information Resources) International Roundtable for Library and Information Science, July 5-6, 2007. Developments in e-science status quo and the challenge, The Japan Foundation, 2007.

"An Administrative Perspective," Chapter 14, *Proven Strategies for Building an Information Literacy Program*, Susan Curzon and Lynn Lampert, editors, Neal-Schuman Publishers, Inc., New York, 2007. pp. 229-237.

Library Management and Marketing in a Multicultural World, proceedings of the IFLA Management and Marketing (M&M) Section, Shanghai, China, August 16-17, 2006, edited. K.G. Saur, Munchen, Germany, June 2007. 390 pp.

Top Ten Assumptions for the Future of Academic Libraries and Librarians: a report from the ACRL Research Committee, with Frank R. Allen and Jon R. Hufford. *College & Research Libraries,* April 2007, vol.68, no.4. pp.240-241, 246.

To Stand the Test of Time: Long-term Stewardship of Digital Data Sets in Science and Engineering. A report to the National Science Foundation from the ARL Workshop on New Collaborative Relationships: the Role of Academic Libraries in the Digital Data Universe. September 26-27, 2006, Arlington, VA. p.141. http://www.arl.org/bm~doc/digdatarpt.pdf

"Enabling Interaction and Quality in a Distributed Data DRIS," *Enabling Interaction and Quality: Beyond the Hanseatic League*. 8th International Conference on Current Research Information Systems, with D. Scott Brandt and Michael Witt. Promoted by euro CRIS. Leuven University Press, 2006. pp.55-62. Editors: Anne Garns Steine Asserson and Eduard J. Simons.

"Standards for College Libraries, the final version approved January 2000," prepared by the ACRL College Libraries Standards Committee (member), *C&RL News*, March 2000, p.175-182.

"Standards for College Libraries: a draft," prepared by the ACRL College Libraries Section, Standards Committee (member), *C&RL News*, May 1999, p. 375-381.

"Statistical Measures of Usage of Web-based Resources," *The Serials Librarian,* vol. 36, no. 1-2 (1999) p. 207-10.

"An Opportunity: Cooperation between the Library and Computer Services," in *Building Partnerships: Computing and Library Professionals.* Edited by Anne G. Lipow and Sheila D. Creth. Berkeley and San Carlos, CA, Library Solutions Press, 1995. p. 69-70.

"Faculty Status of Librarians: A Comparative Study of Two Universities in the United Kingdom and How They Compare to the Association of College and Research Libraries Standards, " in *Academic Librarianship, Past, Present, and Future: a Festschrift in Honor of David Kaser.* Englewood, Colorado; Libraries Unlimited, 1989. p. 67-78. Review in: *College & Research Libraries,* vol. 51, no. 6. November 1990, p. 573-574.

Presentations: (Representative)

"How Long the Odyssey? Transitioning the Library and Librarians to Meet the Needs and Expectations of the 21st Century University," David Kaser Lecture, School of Informatics & Computing, Indiana University, Bloomington, IN, November 16, 2015.

Presentation at University of Cape Town, Cape Town, South Africa, August 20, 2015.

"The Challenge of Discovering Science and Technology Information," Moderator, International Federation of Library Associations (IFLA) Science and Technological Libraries Section Program, Cape Town, South Africa, August 18, 2015.

"An Odyssey in Data Management: Purdue University," International Federation of Library Associations (IFLA) Research Data Management: Finding Our Role – A program of the Research Data Alliance, Cape Town, South Africa, August 17, 2015.

Presentation at University of Pretoria, Pretoria, South Africa, August 11, 2015.

Co-Convener with Sarah Thomas, Harvard University, at the Harvard Purdue Symposium on Data Management, Harvard University, Cambridge, MA, June 15-18, 2015.

"Strategic Communication," panel discussion on the Director's role and perspective on library communications at Committee on Institutional Cooperation (CIC) Center for Library Initiatives (CLI) Annual Conference, University of Illinois Urbana-Champaign, May 20, 2015.

"Issues in Data Management," panel discussion moderated by Catherine Woteki, United States Undersecretary for Research, Education & Economics at 20th Agriculture Network Information Collaborative (AgNIC) Annual Meeting in the National Agricultural Library, Beltsville, MD, May 6, 2015.

"Active learning/IMPACT & the Active Learning Center at Purdue University," Florida Institute of Technology, Melbourne, FL, February 11, 2015.

"Science+art=creativity: libraries and the new collaborative thinking," panel moderator, International Federation of Library Associations (IFLA) 80th General Conference and Assembly, Lyon, France, August 19, 2014.

"Purdue University The Active Learning Center—A new concept for a library," Association of University Architects 59th Annual National Conference, University of Notre Dame, South Bend, IN, June 23, 2014.

"Big Data & Implications for Academic Libraries," keynote speaker, Greater Western Library Alliance (GWLA) Cyber-infrastructure Conference, Kansas City, MO, May 28, 2014.

"Research Infrastructure," panel moderator, Association of Research Libraries (ARL) 164th Membership Meeting, Ohio State University, Columbus, OH, May 7, 2014.

"An Eight Year Odyssey in Data Management: Purdue University," International Association of Scientific and Technological University Libraries (IATUL) 2013 Workshop Research Data Management: Finding Our Role, University of Oxford, UK, December 2013.

"Purdue University Libraries & Press: from collaboration to integration," Ithaka Sustainable Scholarship, The Evolving Digital Landscape: New Roles and Responsibilities in Higher Education, libraries as publishers, New York, New York, October 2013.

"Tsinghua and Purdue: Research Libraries for the 21st Century," Tsinghua University, Tsinghua, China, August 2013.

"Purdue Publishing Experience in the Libraries Publishing Coalition," Association of American University Presses Annual Meeting, Press-Library Coalition Panel, Boston, Massachusetts, June 21, 2013.

"Indiana University Librarians Day: Purdue University Libraries Ready for the 21st Century," Indiana University Purdue University Indianapolis (IUPUI), June 7, 2013.

"Purdue University Libraries and Open Access; CNI Project Update," Coalition for Networked Information, San Antonio, TX, April 5, 2013.

Memorial Resolution, honoring Joseph Brannon, to the Board of the Association of College & Research Libraries, Seattle, WA, January 2013.

"An overview of sustaining e-Science collaboration in an Academic Research Library—the Purdue experience," Duraspace e-Science Institute webcast, October 17, 2012.

"The Role of Libraries in Data Curation, Access, and Preservation: an International Perspective, " Panel Moderator, 78th General Conference and Assembly, International Federation of Library Associations, Helsinki, Finland, August 15, 2012.

"21st Century Libraries," moderator of First Plenary Session, International Association of Technological University Libraries 33rd Annual Conference, Singapore, June 4, 2012.

"Planning for New Buildings on Campus," panel presenter, University of Calgary Building Symposium on Designing Libraries for the 21st Century, Calgary, Alberta, Canada, May 17, 2012.

"Data Management and e-Science, the Purdue Response." Wiley-Blackwell Executive Seminar-2012, Washington, DC, March 23, 2012.

"An overview of Sustaining e-Science Collaboration in Academic Research Libraries and the Purdue Experience." Leadership & Career Development Program Institute, Association of Research Libraries (ARL). Houston, TX, March 21, 2012.

"An overview of Data Activities at Purdue University in response to Data Management Requirements." Coalition for Academic Scientific Computation (CASC). Arlington, VA, September 8, 2011.

"Getting on Track with Tenure," Association of College and Research Libraries (ACRL) Research Program Committee. Washington, DC, June 26, 2011.

"Integration of the Press and Libraries Collaboration to Promote Scholarly Communication," Association of Library Collections & Technical Services (ALCTS) Scholarly Communication Interest Group – American Library Association, New Orleans, Louisiana, June 25, 2011.

"Cooperation for improving access to scholarly communication," with N. Lossau (Germany), C. Mazurek (Poland), J. Stokker (Australia), panel moderator and presenter, Second Plenary Session, International Association of Scientific and Technological University Libraries (IATUL) 32nd Conference 2011, Warsaw, Poland. May 29-June 2, 2011.

"Riding the Wave of Data," STM Annual Spring Conference 2011. Trailblazing & transforming scholarly publishing **2011**. Washington, D.C., April 28, 2011.

"Confronting old assumptions to assume new roles: physical and operational integration of the Press and Libraries at Purdue University," keynote speaker, 2011 BioOne Publishers & Partners Meeting. Washington, D. C., April 22, 2011.

"Are MLS Graduates Being Prepared for the Changing and Emerging Roles that Librarians must now assume within Research Libraries?" University of Oklahoma Libraries Seminar, March 4, 2011, Oklahoma City, Oklahoma.

"The Future Role of University Librarians," the University of Cape Town, South Africa, February 25, 2011.

"New Roles for Librarians: the Application of Library Science to Scientific/Technical Research – Purdue University – a case study. International Council for Science and Technology (ICSTI); Ottawa, Canada. June 9, 2009.

"Reinventing Science Librarianship: Models for the Future," Association of Research Libraries / Coalition for Networked Information. October 16-17th, 2008, Arlington, VA. Moderator and convener of Data Curation: Issues and Challenges.

"Practical Implementation and Opportunities Created at Purdue University," African Digital Curation Conference, Pretoria, South Africa, (live video transmission), February 12, 2008.

Keynote speaker. "*Scholarly Communication & Academe: The Winter of Our Discontent,"* XXVII Charleston Conference on Issues in Book and Serial Acquisition, Charleston, South Carolina. November 8, 2007.

Keynote speaker. "*Enabling Access to Scientific & Technical Data-sets in e-Science: a role for Library and Archival Sciences,"* Greater Western Library Alliance (GWLA), Tucson, Arizona. September 17, 2007. A meeting of library directors and vice presidents for research of member institutions.

"*The Challenge of e-Science Data-set Management to Domain Sciences and Engineering: a Role for Academic Libraries and Librarians,"* KIT (Kanazawa Institute of Technology)/CLIR (Council of

Library and Information Resources) International Roundtable for Library and Information Science, July 5-6, 2007. Invited to participate by the Deputy Librarian of Congress.

International Association of Technological University Libraries (IATUL), Stockholm, Sweden. June 8, 2007**.** Invited paper**,** *Enabling International Access to Scientific Data-sets: creation of the Distributed Data Curation Center (D2C2).*

"A New Collaboration for Librarians: The Principles of Library and Archival Sciences Applied to the Curation of Datasets," Symposium of the Libraries and the College of Engineering, University of Louisville, April 6, 2007.

"Purdue University Libraries: Through Pre-eminent Innovation and Creativity, Meeting the Challenges of the Information Age," Board of Trustees, Purdue University, February 15, 2007.

ARL Workshop on New Collaborative Relationships: The Role of Academic Libraries in the Digital Data Universe, September 26-27, 2006, Arlington, VA. Invited participant.

NARA and SDSC: A partnership. A panel before the National Science Foundation, June 27, 2006. Arlington, VA. Invited participant.

"Kaleidoscope of Scientific Literacy: fusing new connections," with Diane Rein, American Library Association, Association of College and Research Libraries, Science & Technology Section, Annual Conference, New Orleans, June 26th, 2006.

"Leadership for Learning: Building a Culture of Teaching in Academic Libraries – an administrative perspective," American Library Association, Association of College and Research Libraries, Instruction Section, Annual Conference, New Orleans, June 25th, 2006.

"Building an interdisciplinary research program in an academic library:
how the Libraries'associate dean for research makes a difference at Purdue University," International Association of Technological University Libraries (IATUL), Porto, Portugal, May 23rd, 2006.

"Enabling Interaction and Quality in a Distributed Data DRIS," *Enabling Interaction and Quality: Beyond the Hanseatic League*. 8th International Conference on Current Research Information Systems, with D. Scott Brandt and Michael Witt. Promoted by euro CRIS, Bergen, Norway, May 12th, 2006, Brandt, and Witt presented in person

"Interdisciplinary Research," with D. Scott Brandt, Coalition for Networked Information (CNI) Spring Meeting: Project Briefing, Washington, D.C., April 3rd, 2006.

"An Interview with Purdue's James Mullins," a podcast submitted by Matt Pasiewicz, on *Educause Connect,* http://connect.educause.edu/James_L_Mullins_Interview_CNI_2005

“Managing Long-Lived Digital Data-sets and their Curation: Interdisciplinary Policy Issues,” Managing Digital Assets Forum, Association of Research Libraries (ARL), Washington, D.C., October 28th, 2005.

“The Odyssey of a Librarian.” Indiana Library Federation (ILF), District 2 Meeting, South Bend, Indiana. October 4th, 2005.

"New College Library Standards," Standards Committee Presentation, ALA, Chicago, July 7, 2000.

SUNY Library Directors, Lake George, New York. “*The College Library Standards: a Tool for Assessment.”* April 5, 2000.

Tri-State College Library Association, *Finding You Have Talents You Never Knew You Had,* Penn State Great Valley, March 25, 2000.

Using Web Statistics, American Library Association, New Orleans, June 24, 1999.

Keynote speaker at the JSTOR Workshop, January 29, 30, 1999. University of Pennsylvania, Philadelphia, PA.

"The New Standards for Electronic Resources Statistics," Society of Scholarly Publishers, Washington, D.C., September 17, 1998.

"Evaluating Online Resources: Now that you've got them what do you do?," joint presenter with Chuck Hamaker, LSU, at the NASIG Conference, Boulder, Colorado. June 1998.

"What Employers Are Looking for in New Librarians?" Pennsylvania Library Association, Philadelphia. September 26, 1997.

"The Theory of Matrix Management" panel presentation of the Comparative Library Organization Committee of the Library Organization and Management Section of the Library Administration and Management Association, a division of the American Library Association, Annual Meeting, Chicago, June 24, 1990.

Professional Involvement: (summary of recent emphasis)

The focus for my professional involvement and research has moved recently toward managing massive data-sets. This has resulted in working with faculty in the sciences and technology to determine how librarians can collaborate in managing, curating, and preserving data-sets for future access and documentation. This has included various speaking opportunities as well as participation in planning with the National Science Foundation (NSF) on ways in which librarians can be integrated more completely into the funded research process. Participation in the Kanazawa Institute of Technology/Council of Library Resources Roundtable was particularly rewarding and provided new opportunities to share with international colleagues the issues surrounding data-set management. I was

the champion for the creation of the Distributed Data Curation Center (D2C2) at Purdue University (http://d2c2.lib.purdue.edu/)

Throughout my career, beginning with my dissertation, I have been actively involved with assessing and evaluating libraries. In the fall of 1999, I contacted twenty-two academic library directors to determine whether the need was also felt by others. The response was overwhelmingly affirmative. This resulted in a meeting at ALA Midwinter, January 2000. A formal meeting followed at Villanova University in April 2000. As convener, I helped to form the University Libraries Group (ULG), modeled after the Oberlin Group for college libraries. The ULG is made up of university libraries that support diverse wide-ranging programs through doctoral level and have a level of support that places them in the top tier of academic institutions. A few of the member libraries, along with Villanova, are William and Mary, Wake Forest, Lehigh, Carnegie-Mellon, Tufts, Marquette, Miami of Ohio, and Southern Methodist.

In 1994 appointed to the Standards Committee, College Section, Association of College and Research Libraries. During the next six years, the Committee concentrated on changing the focus of the standards from quantitative analysis of input and output factors to emphasis on assessment of the outcome. Culmination of the work was a re-issue of the *Standards for College Libraries* in 2000. The knowledge gained through my work experience enabled me to formulate the changes needed in the standards. This work allowed for close collaboration with accrediting agencies, both professional and regional.

During this same time another focus emerged, the impact of digital resources. Through my work on the JSTOR Statistics Task Force, standards were developed on the collection of use of electronic databases. This Standard was later adopted in 1998 by the International Consortium of Library Consortia (ICOLC).

In 2002, the American Library Association appointed me to serve as the liaison to the Marketing and Management Section of the International Federation of Library Associations (IFLA).

Professional Service: (representative list)

Nominations Committee, Association of Research Libraries (ARL), 2016.

Steering Committee, Scholarly Publishing and Academic Resources Coalition (SPARC), 2016 – 2017.

"Excellence in Library Services," Chair, Review Team, University of Hong Kong, Hong Kong, August 24-27, 2015.

Chair, Management Advisory Board, 2015-2017; Member, Scientific Advisory Board, arXiv, Cornell University, 1/1/2013 – present.

Advisory Board for the Wayne State University School of Library and Information Science, July 2012 – present.

Advisory Board for Microsoft Academic Search, 2012 – 2015. Redmond, WA.
Transforming Research Libraries, a Strategic Direction Steering Committee of the Association of Research Libraries (ARL), 2012-2015.
Science and Technology section, representing ARL, International Federation of Library Associations (IFLA), Chair, 2013 – 2017; Member, 2011 to present.
Member of University of Pretoria, South Africa, Library Review Committee. August 2013.
Co-chair, Local Arrangements Planning Committee for 2013 Conference, Association of College and Research Libraries (ACRL), a division of the American Library Association (ALA).
Association of Research Libraries Leadership & Career Development Program Mentor, 2011-2017.
e-Science Task Force, Association of Research Libraries. July 2006 – present. Chair, October 2011 – October 2012.
Board of Directors, International Association of Technological University Libraries (IATUL). January 2008 – December 2014.
Midwest Collaborative for Library Services (MCLS); Board Member, October 2010 – December 2012.
Chair, Library Directors, Committee on Institutional Cooperation (CIC), July 2010 – June 2012.
Board of Directors, Association of Research Libraries (ARL); October 2008 – October 2011.
Scholarly Communication Steering Committee, Association of Research Libraries (ARL) 2008-2011.
Editorial Board, *College and Research Libraries*, Association of College and Research Libraries, American Library Association. January 2008 – December 2014.
Chair, Organizing Committee for IATUL Conference 2010, June 21-24, 2010, Purdue University, West Lafayette, Indiana/Chicago, Illinois.
Conference Planning Committee for National Conference of the Association of College and Research Libraries, 2009, Seattle, Washington.
Research Committee, Association of College and Research Libraries, ACRL, division of ALA. 2002-2007, chair, 2005-2007.
Association of Research Libraries, Search and Screen Committee, Executive Director. March – January 2008.
Center for Research Libraries, Board of Directors. April 2006 – April 2012.
Academic Libraries of Indiana, Board of Directors, 2004 – present. Vice-president, 2005-2007. President, 2007- 2009.

ALA Representative to the International Federation of Library Associations (IFLA), Marketing and Management (M&M) Section, initial term 2003-2007, re-appointed for second term, 2007-2011.
Invited to represent Research Libraries at the ACRL/3M Wonewok Retreat to assess Marketing of Academic Libraries, October 2002.
Hugh A. Atkinson Award Committee, LAMA Representative, ALA, 2001-2005.
Program Committee, Library Administrators and Management Association (LAMA), a division of ALA. 1996-2001.
ACRL, Standards and Accreditation Committee, a division of ALA. Liaison to RBMS Section of ACRL. 1997-2002.
Elected to the Executive Committee of LAMA, LOMS, a division of the American Library Association, 1998-2000. Nominated as Chair/Elect for 2003 – 2005.
Columbia University Press Advisory Committee. 1996 - 2000.
LITA/LAMA Conference Evaluation Committee, Pittsburgh, Pennsylvania, October 1996.
"New Learning Communities," Coalition for Networked Information, Indianapolis. November 19-21, 1995. Facilitator for invitational, national conference committed to developing collaborative learning and teaching techniques, involving librarians.
Planning Committee-Evaluation. LITA/LAMA 1996 Conference, Pittsburgh. This first conference, to be held jointly between two divisions of ALA, will focus on new technologies within libraries.
Indiana Cooperative Library Services Authority (InCoLSA), elected to Executive Committee, April 1991, served as President in 1993-94. InCoLSA is a statewide network of academic, public, school, and special libraries that supports library cooperation for cataloging, interlibrary loan, collection development and application of new technologies.
Governor’s Conference on Libraries and Information Services. Served on Planning Committee, Academic Libraries Representative, appointed by the Governor to represent academic libraries in Indiana, Chair, Finance Committee, April 1989-July 1991.
Indiana Library Endowment Foundation Board, 1984-92. Charter Member, 1984, President, 1988-1992. 2004-2005.

University Service: (Summary)

Served on search and screen committees for senior positions including chancellor, dean, and directors; most recently I have been asked to serve on the search committee for the provost of Purdue University. At MIT service included the Library Council & appointment to the Administrative Council by President

Vest, 2001-2003 & Member of the Faculty Committee on the Library System. At Purdue appointed by the President to the Search Committee for the Provost, October 2007 to May 2008; member of the Capital Projects Committee, and IT Operational Oversight Committee as senior academic dean, 2008-2014.

Global Council, Global Policy Institute, 2012 – 2016.

Academic Program Excellence and Rankings (APER) project team, 2014.

Representative of the Academic Deans on the Re-engineering Business Operations, Purdue University, 2016 –

Academic Deans Council chaired by Provost – 2004 – 2017.

University Promotion and Tenure Committee – 2006 – 2017.

"Outstanding Team Award, Electronic Reserve Project," served as Chair, recognition awarded by the President of Villanova University to one team who made an outstanding contribution to the operations of the University, selected by a committee of administrators, faculty, and staff. Awarded September 9, 1999.

Nominated for the IUSB Lundquist Award, 1995 & 1996. The Lundquist award is given to faculty who have "exhibited excellence in teaching, scholarly or artistic achievement, and diversified relevant service..."

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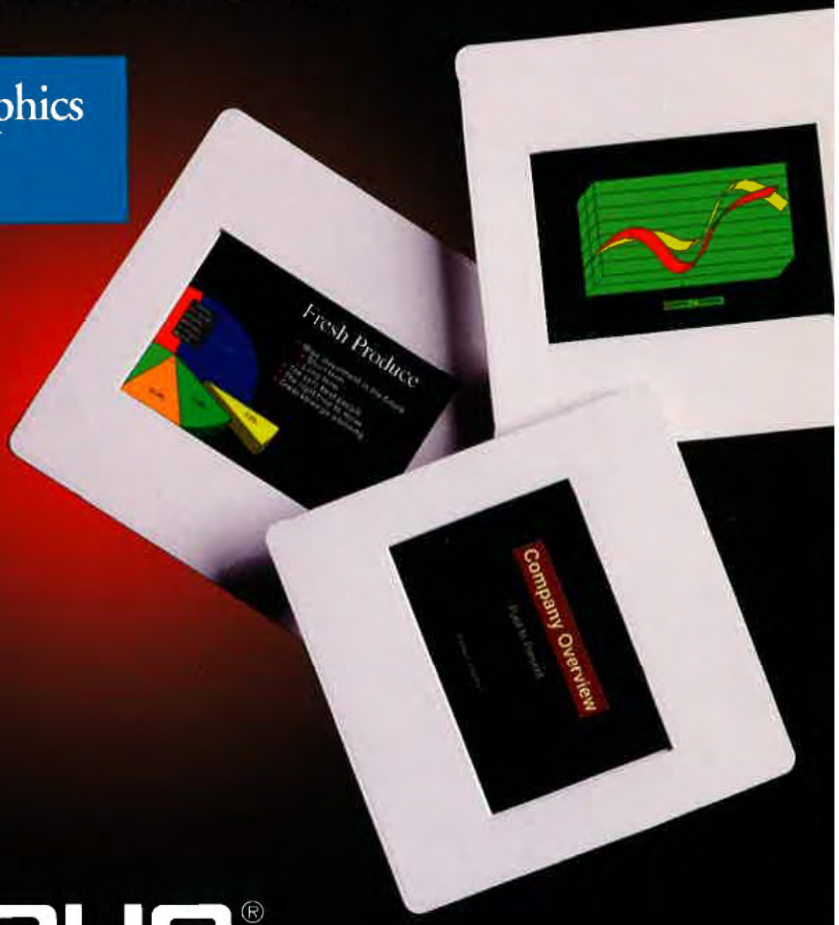
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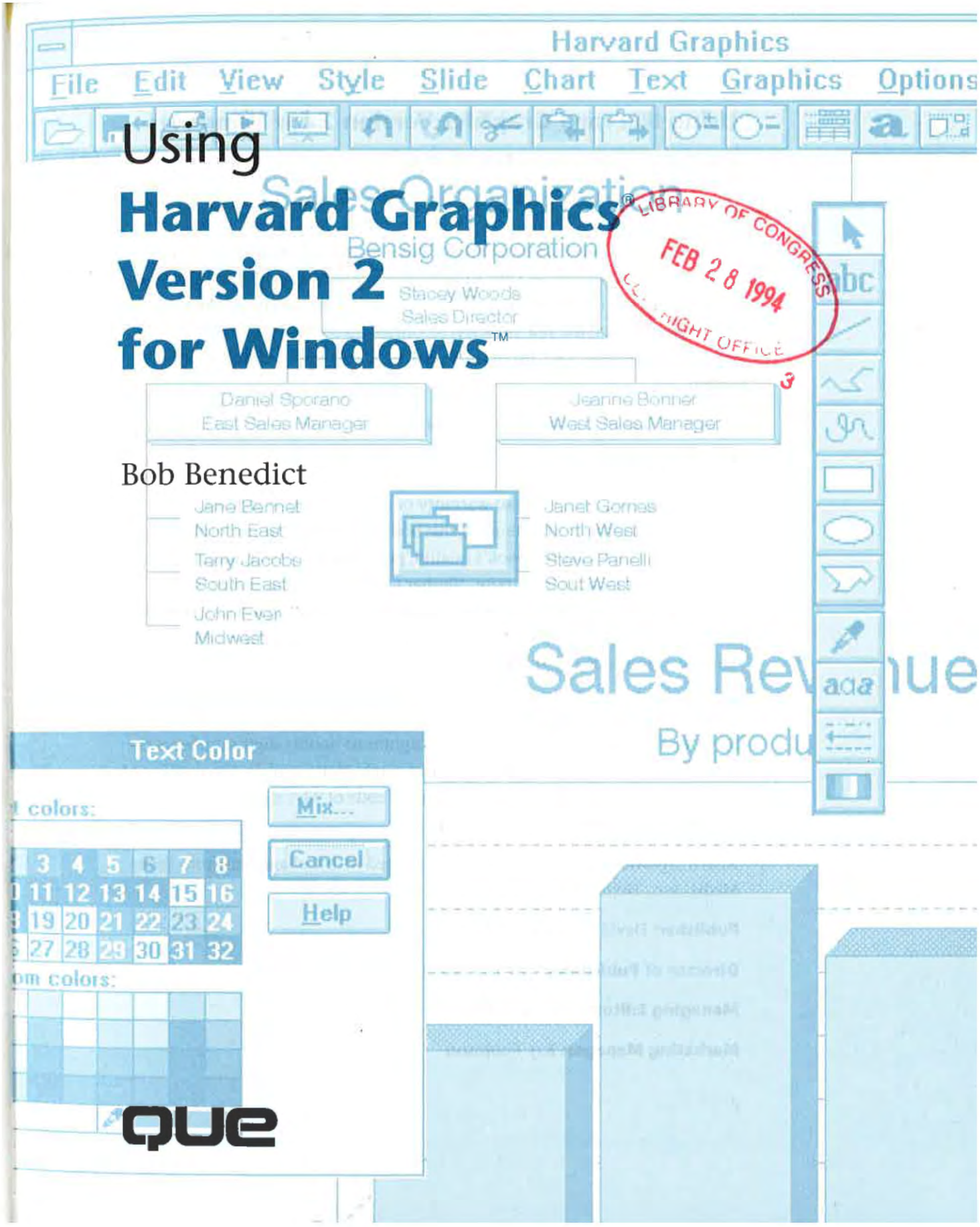
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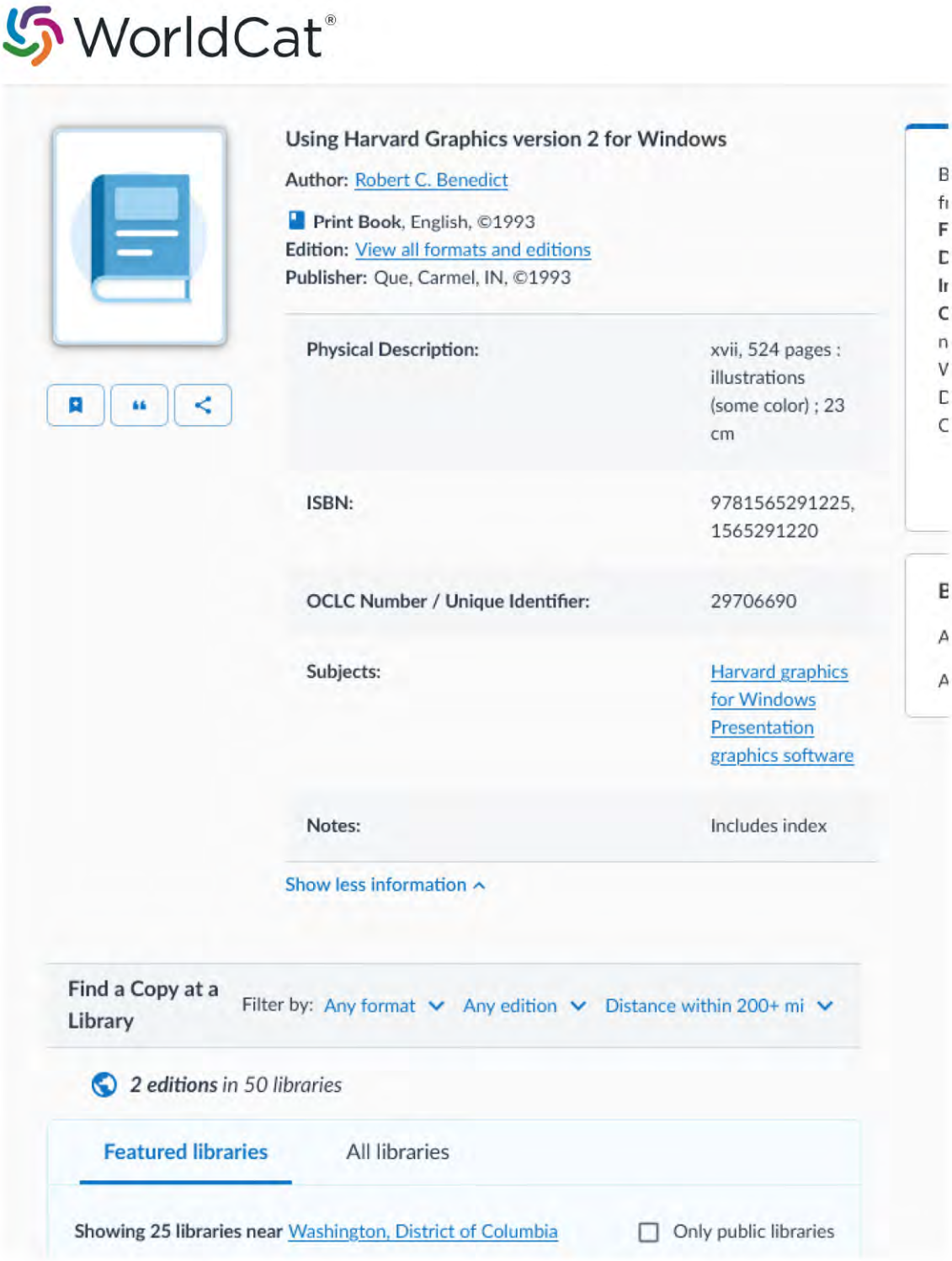
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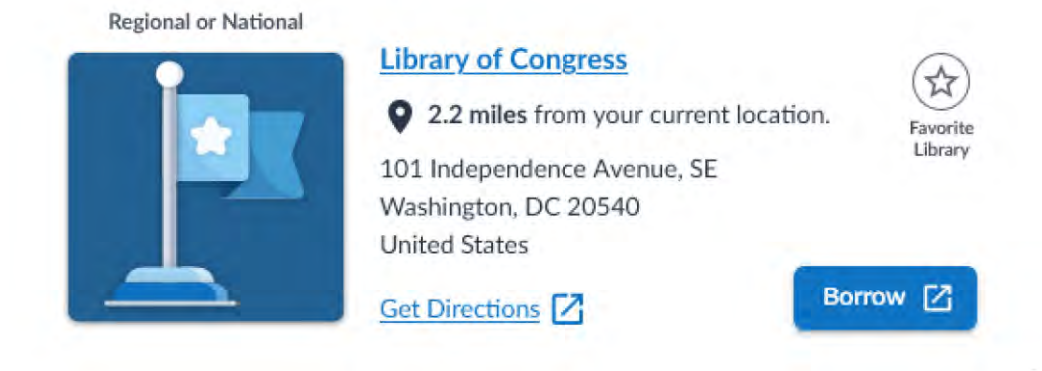
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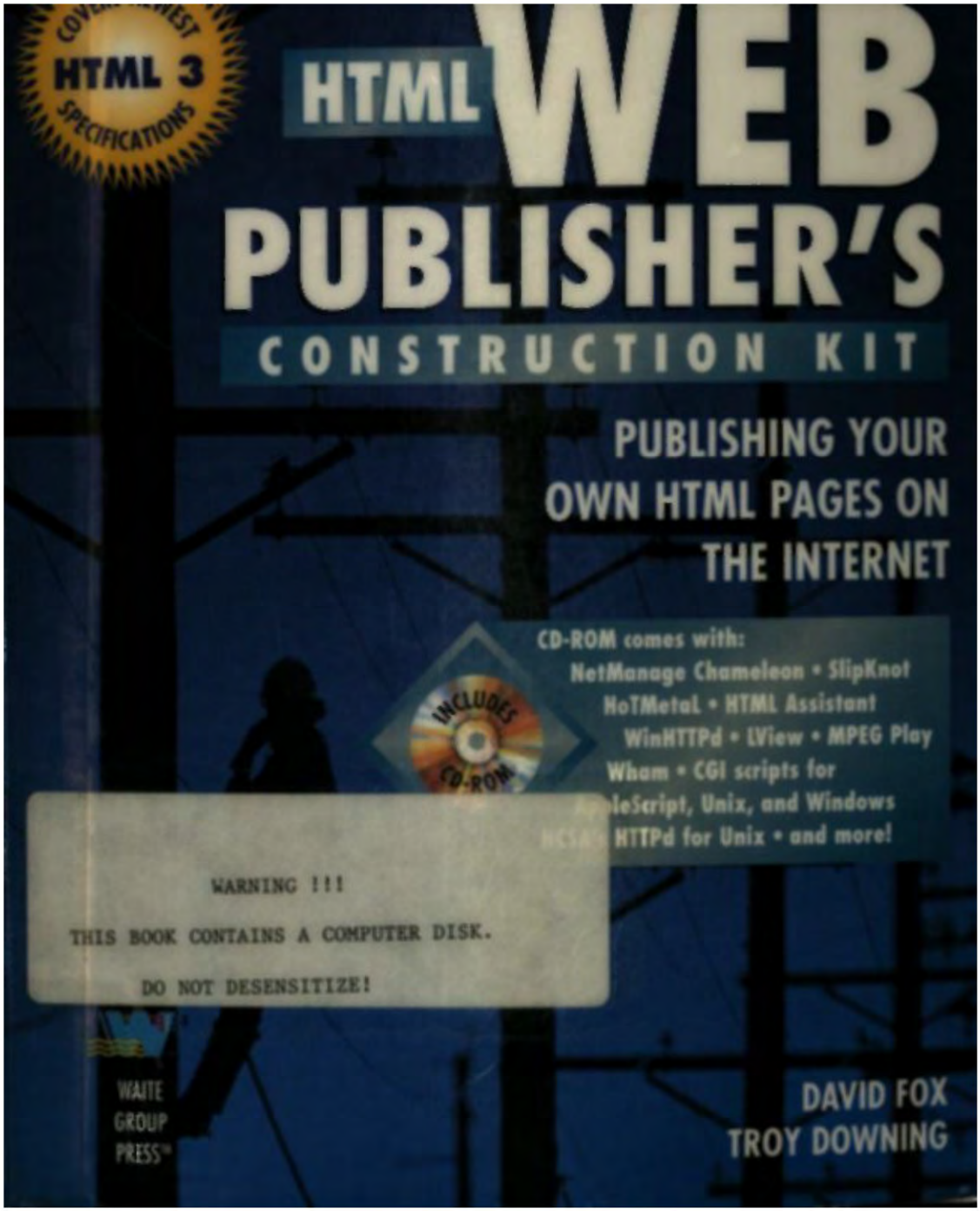
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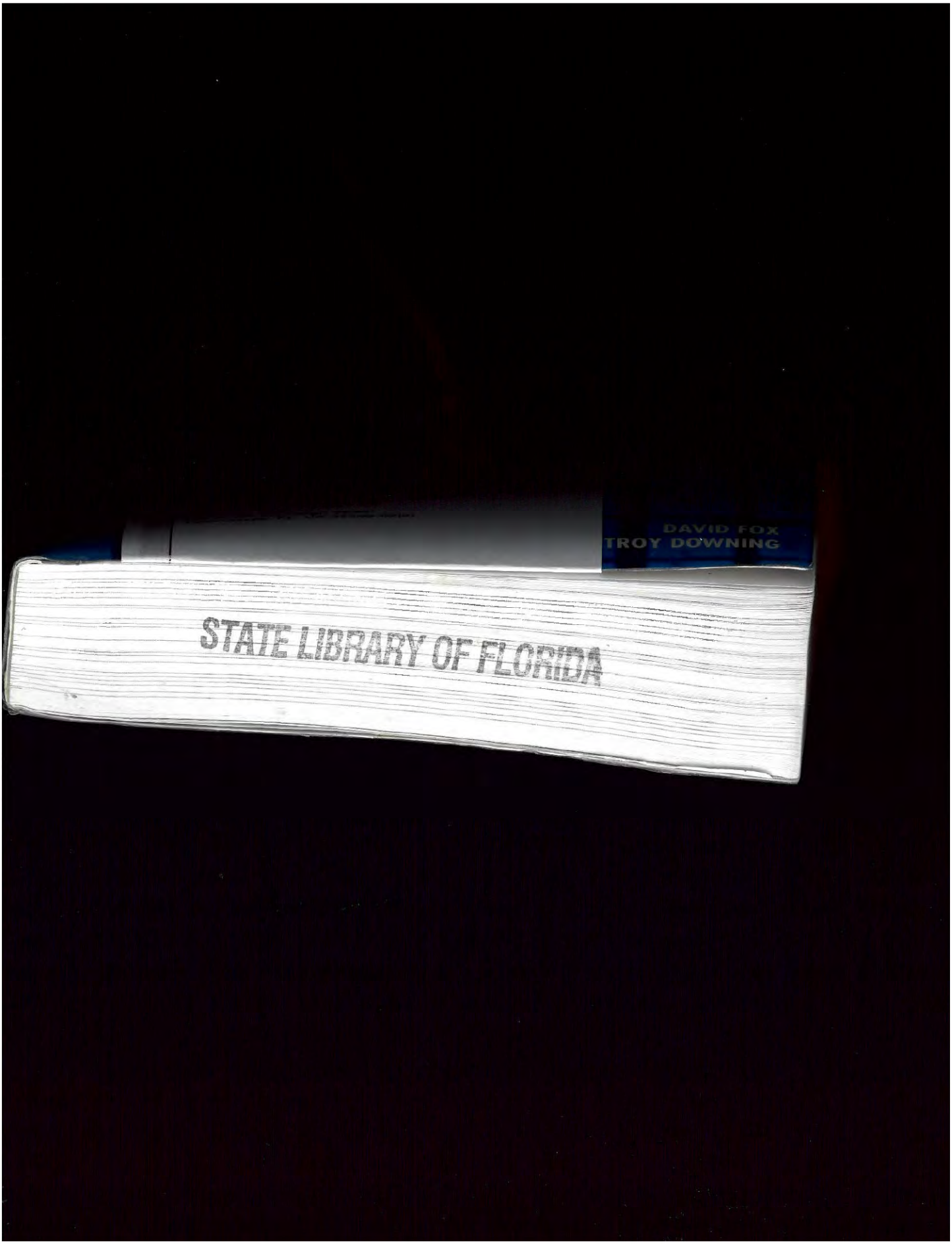
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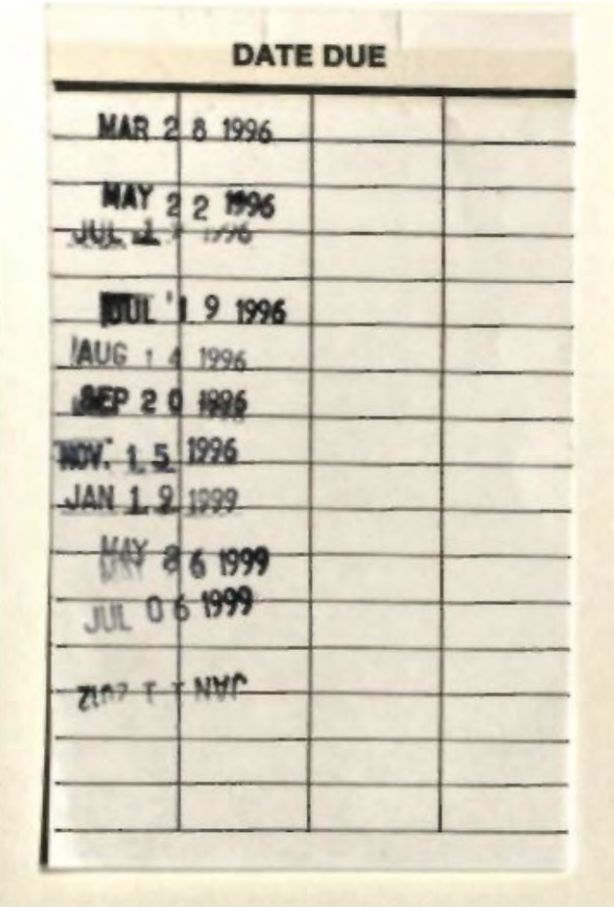
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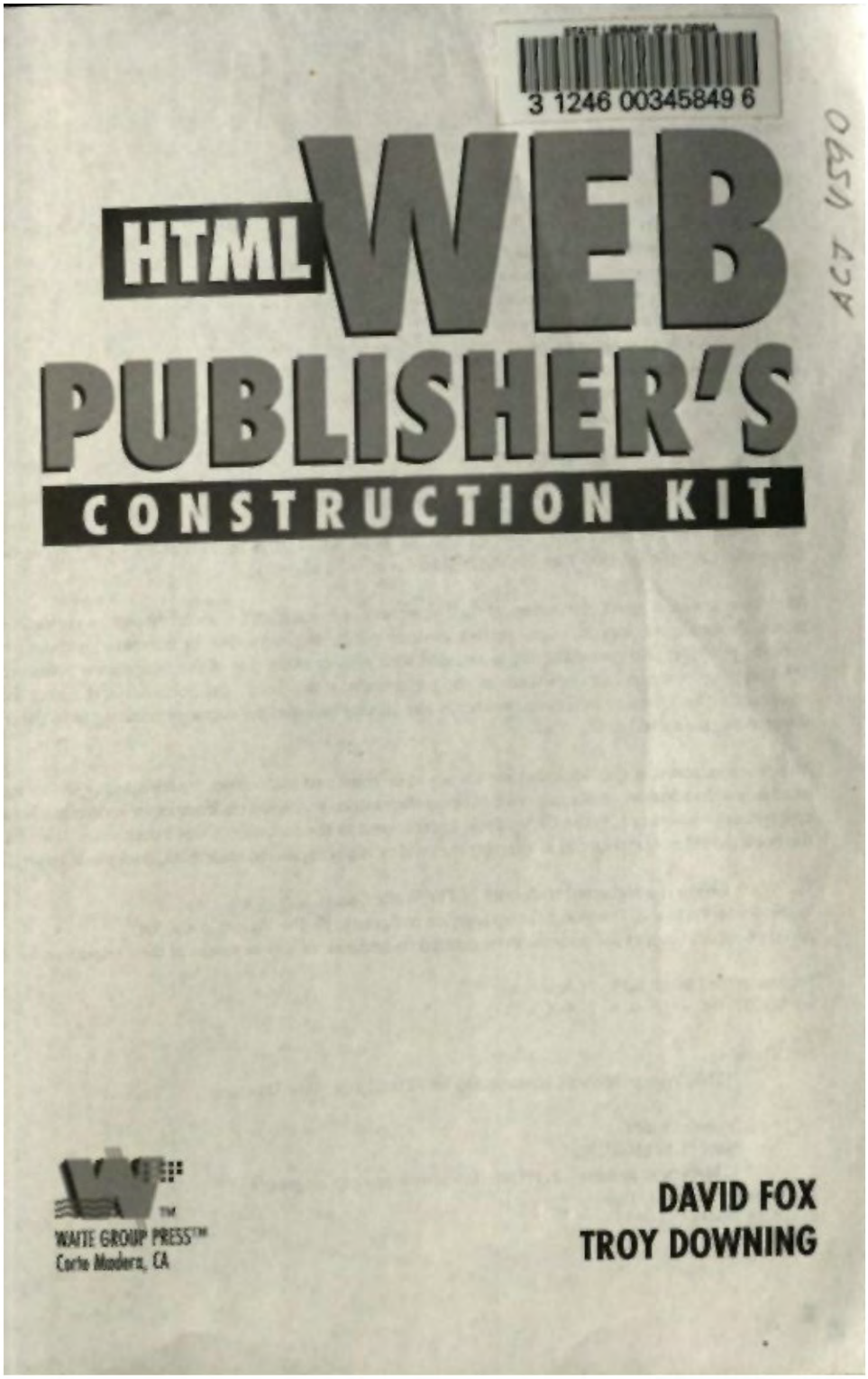
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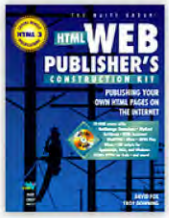
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ATTACHMENT B-2

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HTML Web publisher's construction kit

Authors: David Fox, Troy Downing

Summary: Covers every aspect of WEB publishing, from obtaining the optimal Internet acount to installing the converters, viewers, protocol transfer utilities & communication sockets. Includes SlipKnot, NetManage Chameleon,...

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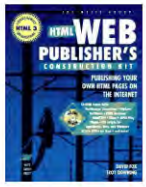
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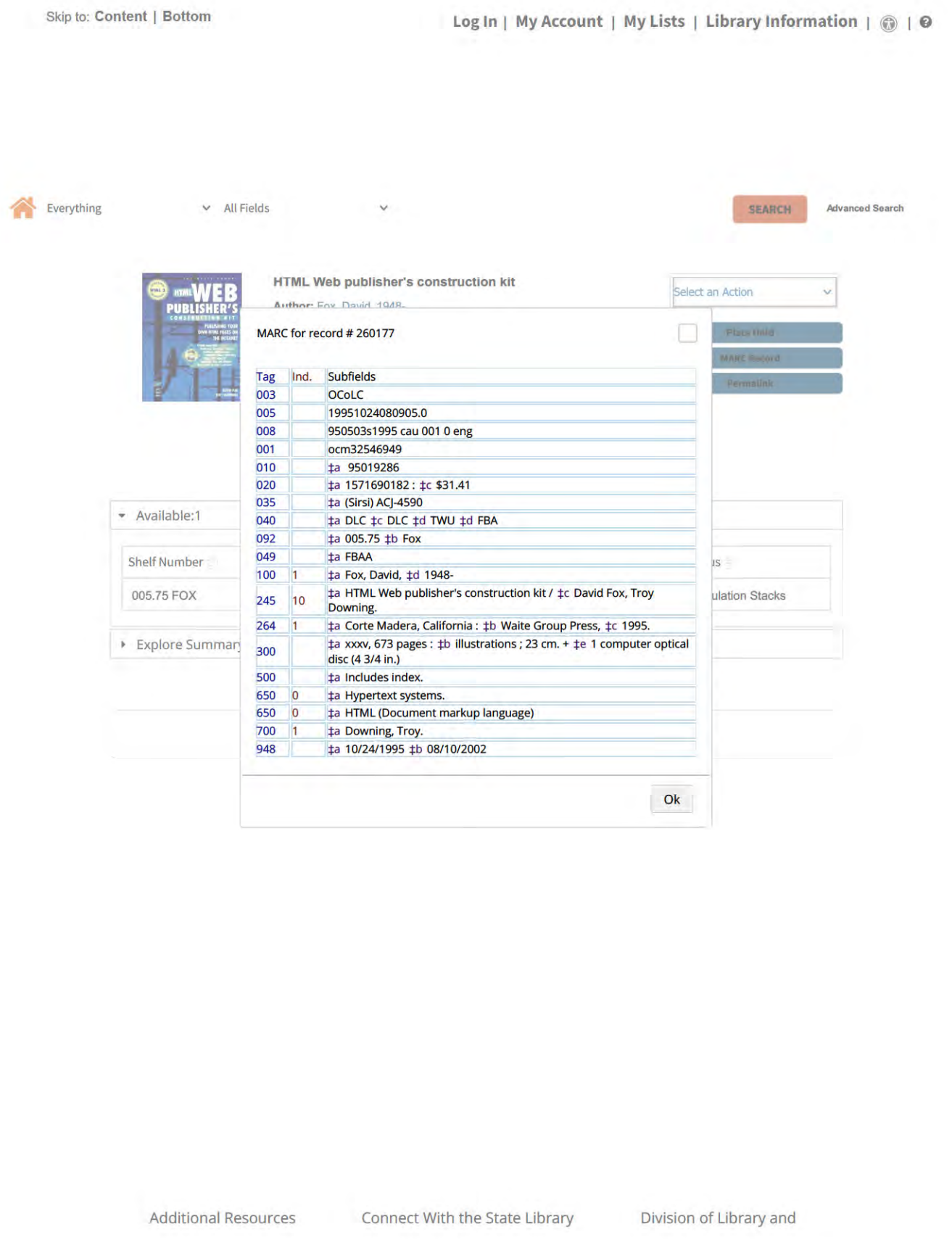
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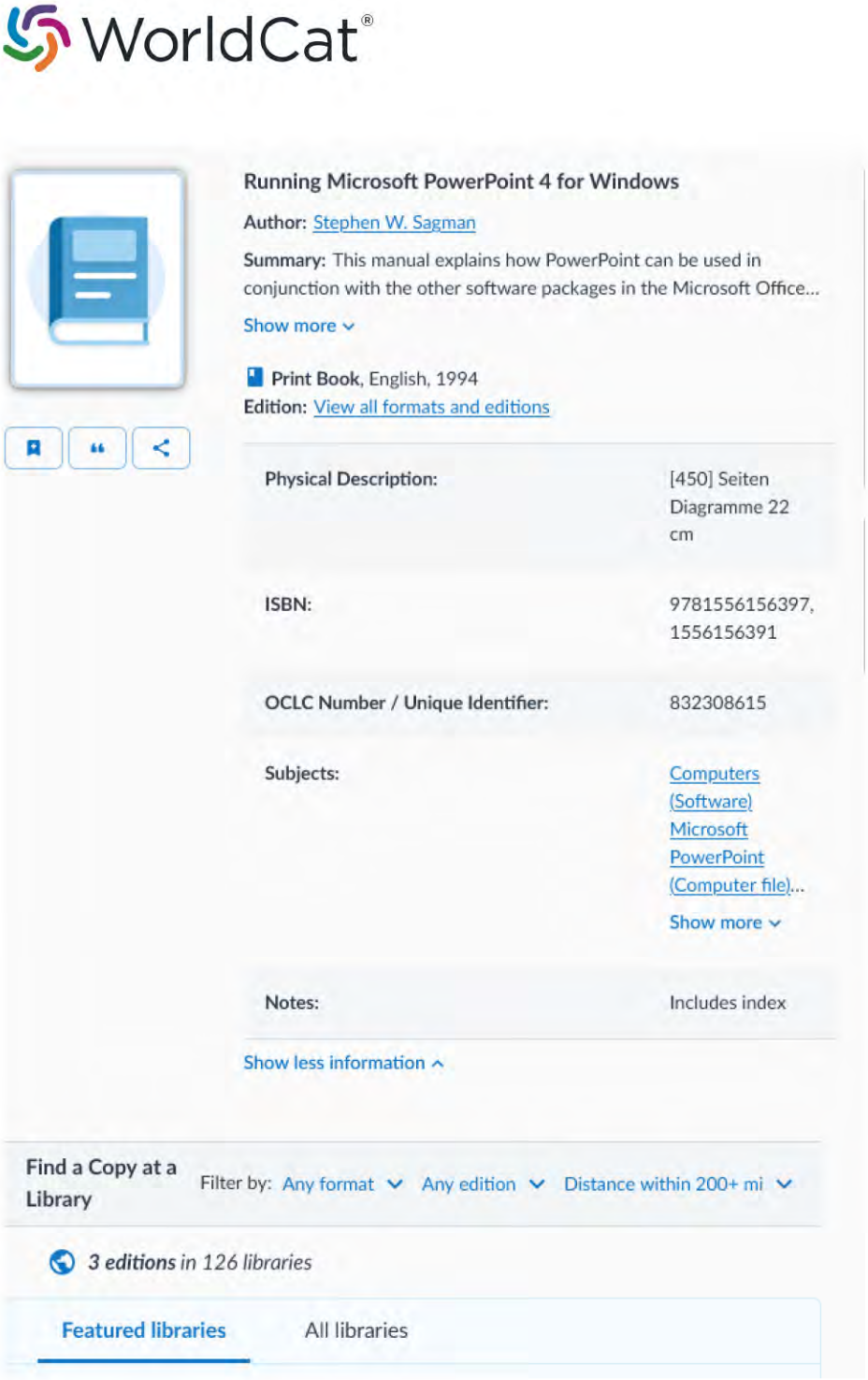
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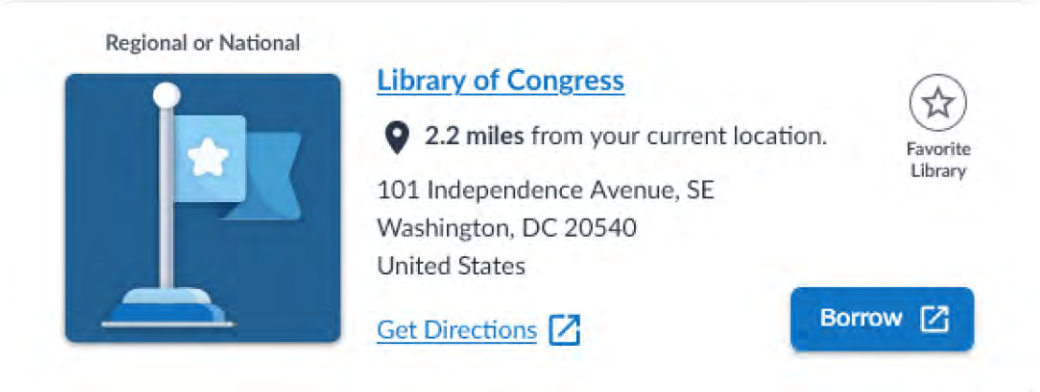
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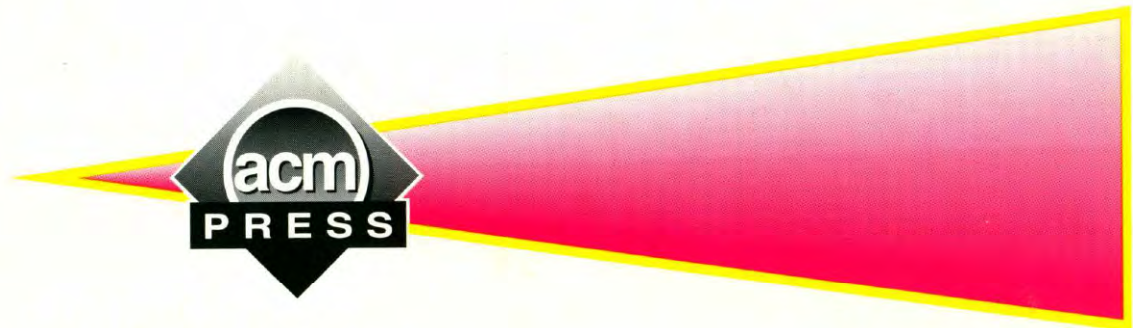
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Information Retrieval from Hypertext Using Dynamically Planned Guided Tours

Catherine Guinan and Alan F. Smeaton
School of Computer Applications, Dublin City University
Glasnevin, Dublin 9, Ireland
e-mail: smeaton@dcu.ie

Abstract

In using any hypertext system a user will encounter many technical problems which have been well-documented in the literature. Two of the more serious problems with using hypertext are user disorientation and the retrieval of information. Another less often addressed problem is that of the logical sequencing of nodes. In the work reported in this paper we address these three problems by combining Hammond and Allinson's guided tour metaphor and Frisse's information retrieval techniques to dynamically create guided tours for users in direct response to a user's query. One of the features of our method is that we take advantage of typing of information links in the hypertext to generate a tour which has a judicious sequencing of nodes rather than a simple presentation of hypertext nodes in order of similarity to the user's query. Our method was empirically tested on a population of 125 users who generated a total 973 individual tours and all user actions and responses to questions were logged. The results of this evaluation are presented in this paper.

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1 Introduction

In using any hypertext system an end-user or browser will encounter many technical problems which have been well-documented elsewhere [10]. Two of the more serious of these problems are disorientation and the quality of the information retrieved by the user from the hypertext. In disorientation a user may effectively get lost in the hypertext and not be able to return to a node they previously visited or follow a trail of nodes they found interesting. Related to this is the problem of actually retrieving relevant information from a hypertext. If a user is simply browsing around a hypertext with the sole purpose of finding any interesting or potentially useful information then the browsing metaphor which hypertext encourages is adequate. If, however, a user has a more definite purpose and seeks a specific piece of information from a hypertext then unless the hypertext has been very well-engineered then the user may not be able to retrieve relevant information [16].

In addition to the two problems with using hypertext mentioned above another, less often addressed problem is that of the logical sequencing of nodes as they are presented in a hypertext browse. An end-user of a hypertext has complete control of the sequence of nodes presented to him/her when browsing which is a facet of hypertext with much appeal which can also cause problems as that user tries to assimilate information contained in the nodes that have been viewed. If the logical sequence or the order of node presentation is askew or unbalanced in terms of information content then garnering an overview of the overall information presented will be made more difficult, even if the nodes that have been viewed are all relevant to the user's information requirements. For example, if a user is browsing a hypertext on database topics then it is much more

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sensible for a user to examine overview and introduction nodes before nodes detailing examples and syntax of SQL !

In this paper we explore a method which we believe directly addresses the three problems with browsing through hypertext that we have mentioned above, disorientation, information retrieval and the logical sequencing of nodes. We propose a method for dynamically generating a guided tour through a hypertext in response to a user's query which will plan a tour through a hypertext covering all the nodes the system believes relevant to the user's information need as expressed in a natural language query, which eases disorientation problems by using the guided tour metaphor first proposed by Hammond and Allinson [8] and which takes advantage of typing of information links in the hypertext to present the nodes on the tour in a logical fashion. Effectively we extend the guided tour metaphor by including the information retrieval features proposed by Frisse [5] and we add in logical sequencing of nodes on the tour to complete the process.

The rest of this paper is structured as follows. In the next section we give a brief overview of related work on guided tours, incorporating information retrieval into hypertext browsing and we look at how typing of links and/or nodes has been used in other work. The subsequent section details the mechanism we have devised for dynamically planning tours. In section 4 we give an outline of our experimental environment and in section 5 we present some of our results. A concluding section summarises our work and gives some ideas for future work.

2 Retrieving Information from Hypertext

The metaphor of providing a guided tour through a hypertext to ease problems of disorientation was first proposed by Hammond and Allinson [8] and also used by Trigg [15] in the NoteCards system. In this approach, guided tours were created by the hypertext author and were fixed, static features of the hypertext. Problems of authoring such guided tours have been well- documented in [9] and the notion of a guided tour has been extended and refined numerous times. For example, Zellweger has introduced the idea of scripted documents which are more complex than static guided tours in that scripted documents can have conditional and programmable paths, automated playback and active entries [18] but the common denominator is the approach of offering to guide a user through a hypertext if the user wants to follow the guide.

Traditional information retrieval functionality of ranking a set of documents or texts in response to a users query as described in [12] has been around for a long time and is reasonably well understood. Hypertext-based retrieval of information, effectively by browsing around an information space following authored links, is comparatively recent in popularity. The former is useful for querying, for satisfying user information needs where users know exactly what they are looking for while the latter is more effective where users don't know exactly what they are looking for and are browsing [16]. In between the two extremes there are user information needs which have elements of both of the above and because of this there have been some previous attempts at combining information retrieval and hypertext.

Methods for searching for information in a hypertext have been developed by Frisse [5] who used statistically-based information retrieval techniques to choose a starting node in a hypertext from which users could commence a browsing session. The computation to find the best starting node is based on a user's initial query to the system and recommends a starting point for a user but does not then provide any further guidence to that user in finding relevant information in the hypertext. Dunlop and van Rijsbergen [3] have developed a method for retrieving non- textual information from a hypertext, again using statistically-based approaches.

Coombs [2] describes a system for searching through a hypertext network using natural language queries and boolean based retrieval. Searching in this system can also be restricted to a particular area of the network instead of encompassing the entire information base. These ideas have been implemented and tested in IRIS Intermedia. α−Trellis by Furuta and Stotts [6] is a prototype hypertext browsing and authoring system which incorporates the users browsing experience into the nodes and links structure of hypertext. Petri nets are employed to facilitate this two way specification. Finally, Shepherd et al [14] have developed a system of transient hypergraphs for their citation network whereby the entire hypertext is represented as a hypergraph or a labelled directed graph. Hypergraphs are generated dynamically in response to a users query and are discarded at the end of the query session. Different perspectives of

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the hypertext can be gained by the user during each query session.

In order to increase the richness of knowledge representation in a hypertext the nodes and/or the links may be typed. The term *type* is somewhat overloaded as it can mean many things but in a hypertext context is means a classification of nodes and/or links into one of a pre-defined set of categories. Typing has become quite popular in hypertext systems because of the fact that in general it substantially enhances the quality of the representation of information in the hypertext. Typing has been used in systems like gIBIS, PHI, NEPTUNE, NoteCards and CONCORDE [1]. Ideally, a hypertext system incorporating typing should allow author-defined types as well as having a generic set of types common to most applications. Typing of nodes and/or links in the hypertext may subsequently prove useful in retrieval from hypertext and this is an active area of research in the field.

3 Dynamically Planning Guided Tours

The dynamic aspect of our guided tour comes from the fact that tour creation is postponed until the user enters a natural language search query. This differs from the static tour described earlier in which the hypertext author pre-defines all tours before any user has formulated any information requirements. The guided tour is also logically *planned* in such a way that attention is paid to the types on the information links connecting the individual nodes in the hypertext before a route through those selected nodes is computed.

The method used for selecting the nodes to be included in the tour is based upon the work done by Frisse described in [5]. However unlike Frisse's application, the hypertext we have used does not have a hierarchic topology but more of a network. Propagation of weights upwards as Frisse has done can not therefore apply directly in our case. However, as we shall see, the weights assigned to nodes do depend on the number of immediate neighbours and their weights so the concept of an extrinsic weight as proposed by Frisse still applies.

Upon entering the system the user is asked to input a natural language query from which all stopwords are removed and the remaining words stemmed using a standard algorithm from information retrieval research [11]. An inverse document frequency (IDF) weight is then calculated for each query term which assigns a higher weight to terms which occur less frequently throughout the collection. Each node in the hypertext is given a score which is initially the product of the term frequency or number of times a term occurs in that node, and the IDF weight ($tf * IDF$), for each of the query terms. This term weighting strategy used to assign scores to nodes has been shown to have excellent performance in terms of effectiveness for information retrieval and is also relatively undemanding in terms of computing resources.

The number of connections from each node is also considered to be important in determining which hypertext nodes to include in the tour. Not only must each selected node be relevant to the user query but it must also be well connected to the other nodes in the hypertext to allow the user the option of deviating from the tour. The *goodness of an area* as opposed to the *goodness of a node* is considered to be more important for retrieval purposes. For example, if the weighting mechanism chose as the highest scoring node one which had no connections to any other node in the hypertext this would not be deemed as an appropriate starting point in a guided tour compared to a node which scored less but was immediately connected to many other medium scoring nodes. Therefore, some method of combining a node's score with its neighbour's scores had to be used.

One method of incorporating a neighbours contents into each node as used by Frisse [5] is by calculating the average score of the neighbouring nodes and adding this figure to the current node to give a measure of the utility of each node. This procedure should be repeated for all nodes in the hypertext. In this way, some provision is made for calculating the *goodness of an area* as opposed to *goodness* of each individual node. Formally, the method of measuring the utility of a node can be given as

$$I_i = W_i + \frac{\sum_{j=1}^{n} W_j}{n}$$

where W_i is the $tf * IDF$ weight of node i and W_j is the $tf * IDF$ weight of one of the n nodes *connected* to node i via an authored information link. Having calculated a utility score for each node based on within-node query term frequency, inverse document frequency and contents of linked neighbours, one final adjustment is made to the node scores. In the hypertext we have used each node consists of a short descriptive title plus a body of text. If a node contains some of the query terms in its title then it is more likely that the con-

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tents of that node relate specifically to the search query and so should be more certain of inclusion in the tour. Increasing the weight is one way of ensuring that the node is included in the top ranked nodes.

Once each of the nodes in the hypertext have been assigned a utility score based on the user's query, it is necessary to establish a cut-off point (μ) below which all nodes whose utility score is less than are discounted from inclusion in the tour. All nodes whose weight is greater than or equal to this cut-off or threshold value would be selected for inclusion in the tour.

Initially it was not known what would be the ideal threshold value so this was one of the parameters whose optimal value we determined empirically. The threshold value would also vary for each user query as the strengths of the query-node similarities would vary between queries depending on how close they were to the information in the hypertext. In our experiments reported later, every time a tour is generated for a user, a threshold value was randomly chosen as some fraction of the utility score of the highest-scored node. The fractions used initially came from the set {0.1, 0.2, 0.3, 0.4, 0.5, 0.6}. If, for example, $\mu = 0.3$ was randomly selected, then before a node is selected for inclusion in the guided tour its utility score must be at least 30% of the score of the highest scored node. Depending on which value from the set is selected the actual number of nodes in the tour can vary greatly so the threshold value chosen actually controls tour length.

At this stage, the nodes for the guided tour have been dynamically chosen in response to a user's query and some form of logical ordering has to be imposed on the selected tour nodes. We decided to exploit the relationships between the nodes to plan an ordered path. As part of the hypertext authoring process, the link types between nodes as shown in Table 1 had been used.

Type-1	is_a a_kind_of is_contained_in
Type2	consists_of contains preceeds
Type3	has facilitates refers_to is_related_to

Table 1. Node-node Link Types

A precedence order was established among link types. Higher precedence is given to those link types which define a clear parent-child relationship thereby indicating a distinct hierarchical association between the nodes. Link types in this category are of type-1. Second in order of precedence are type-2 links which indicate that the nodes from which these links emanate should logically precede the destination node where both nodes are to be shown to a user. Lastly, checks are made for the remaining link types, type-3 links.

Once the nodes selected for inclusion in the tour have been ranked by their utility weights, the highest scoring node is examined for links which indicate that it is the child of a parent node also in the tour. These are type-1 links. If a link of this type is present it is followed and the destination node is then examined in the same way provided it is included in the tour. This process continues until the node highest in the tour hierarchy is found. This node becomes the first to be displayed in the tour. It is then examined for type-2 links which indicate that a definite child node exists which should be displayed next. If none exists then type-3 nodes are examined in the following order, *has*, *facilitates*, *refers_to*, and then *is_related_to*. dependThis procedure is followed until every node selected for inclusion in the tour has been positioned correctly relative to each other node in the tour. This positioning is facilitated by means of the link types as mentioned above.

In the next section we shall describe the experiments we ran to determine the optimal value of μ the threshold value for determining inclusion of a node in the tour.

4 Experimental Details

The hypertext browser we developed runs on SUN SPARC workstations using OpenWindows version 2. We used the ORACLE R.DBMS for storage management and the system was written in C with embedded SQL commands. The hypertext we used consisted of 551 nodes of information about the undergraduate course on Databases at Dublin City University. Among these nodes there are a total of 1566 typed links. These links were created manually using the ten distinct link types given earlier which were deemed to encompass the most frequent and important relationships existing between the various nodes. Some of these link types may be applicable to all hypertexts but some will be application dependant. Depending

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on the contents of each individual hypertext, the author will have to determine the relationships between the various nodes as there are no set guidelines on the creation and typing of links. Gray and Shasha devised links of type *example, critique, counter-argument, compared-with* and *continuation* for their NetBook system [7]. Yet another author might formulate different link types for the same system.

The browser we developed is meant to be used in tandem with the Databases lecture course. The user population consisted of 125 undergraduate students who used the system over a period of three months. Their usage of the browser was broken up into three separate batches or assignments. An initial assignment for students was used for familiarisation in which the user became acquainted with the material covered in the database and with how to actually use the browser tool. A user session consists of everything a user does *in one sitting*, including the search query and all the button presses made. A log file was maintained which contains details of every user action during each session. The familiarisation assignment was not logged and the results presented here are for what we term the first and second assigments. The log file details include username, the user's query, tour contents, button presses and their timestamps, etc.

At the end of each session, users were asked a series of questions about the generated tours to give us some feedback on what they thought of the guided tours. These questions asked about users' perceptions of tour length, information coverage and coherence and the responses were analysed. Responses to questions were mandatory in our browser in order to correctly exit the system.

Different tours, even for the same query, were generated by varying the threshold value at which nodes qualify for inclusion in the tour. In assessing and comparing the generated tours, three distinct characteristics can be identified.

- *Tour Length:* This deals with the number of nodes which have been selected for inclusion in the tour. Depending on the threshold value and on the search query the tour length can vary greatly. The more general is the users query, the wider the range of nodes which are eligible for inclusion in the tour while the more narrow or specific the query, the fewer nodes will qualify. Depending on the threshold value μ, which is randomly selected, the length of the tour can vary from consisting of only a few nodes to as many as 50. If a high threshold, say $\mu = 0.5$, is chosen, then fewer nodes will meet the entry criteria of being at least 50% of the highest scoring node than if $\mu = 0.1$ in which case many more nodes will be selected as their utility score only has to be at least 10% of the highest scoring node. The same query entered by two different users at the same time can result in two different tours.

- *Information Coverage:* This characteristic of a guided tour also deals with long versus short tours but is more concerned with the relevance of the retrieved information. For each query, there exists a certain set of relevant nodes and a larger set of irrelevant nodes. The ideal hypertext system would select for inclusion in the guided tour only those nodes which belong in the relevant set. Unfortunately, statistically-based information retrieval techniques like $tf * IDF$ weighting are not sophisticated enough to guarantee this [13]. Obviously, the threshold value influences the information coverage also as the longer the tour the more general will be the information coverage and the shorter a tour, the more specific will be the information coverage.

- *Connectivity:* This characteristic deals with how well-connected or how fragmented is the presentation order of the nodes in the guided tour. The connectivity of a tour can be measured in terms of the existence of authored information links between tour nodes. A tour is considered to be well-connected if each node in the tour is linked via an authored link to the node that follows it on the tour. The hypertext author is the only person who can explicitly define an information link. A tour is considered to be fully fragmented if each node in the tour has no information links to any of its neighbours on the tour. The well-connected tour is the type considered to be ideal for a hypertext used as a learning aid. In this case, each node leads logically to the next in line and no concept is discussed in detail until it has been fully explained in a previous node. The fragmented type of tour consists of nodes plucked from different areas of the hypertext, many of which may have no logical ordering but appear in a random fashion. Again the threshold value can affect this

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characteristic. If the tour is very long more nodes are included and so the chances of having a highly connected tour are greater. Conversely, if the tour is short, no avenue of discussion may be followed too deeply thus leading to a more fragmented type of tour. Theoretically, changing threshold values should have this effect but in reality, the situation may be very different.

To date, no tried and tested method of evaluating hypertext systems has been devised and so our results and analysis will be mainly based on observation of user behaviour and on the answers given to the questions asked at the end of the user session. The increased cognitive complexity of using hypertext systems makes them more difficult to evaluate than information retrieval systems [17]. Two of the characteristics of guided tours which we shall examine, tour length and information coverage will be evaluated by inspecting the users replies to the questions and so will be subject to human error and bias. However, it can be determined by examining these results if the tours have been useful to end users.

5 Experimental Results

There were 580 logged user sessions or tours generated in the first assignment and 393 in the second assignment. Each student on the course was expected to run at least 4 tours in each of the two assignments being logged though some students actually did more, some did less and some did none. Figures such as number of nodes visited and session length did not vary much across the two assignments. In both cases the pattern was that of an exponentially decreasing distribution, i.e. many users visited a few nodes and few users visited many nodes, a result which has been found elsewhere. The details are given below:

	Assign 1	Assign 2
Avg. total nodes seen	23.9	18.4
Avg. time per session	11.9 m	9.8 m

Table 2. Use of browser

Tour length was the first of the results we examined and the users answers to the questions in both assignments differ and are given in Table 3 with the responses *far too long, too long, just right, too short* and *far too short*. The averaged tour length for different values of μ are given in Table 4.

	FTL	TL	JR	TS	FTS
Assign 1	5%	25%	57%	10%	3%
Assign 2	3%	10%	63%	19%	5%

Table 3. User responses to questions on tour length

μ	Assign 1	Assign 2
0.1	34.6	–
0.2	24	–
0.3	16.4	15.6
0.4	12	11.7
0.5	9.1	7.9
0.6	–	5.4

Table 4. Avg. tour lengths for threshold values

In the first assignment, when μ is in the range 0.1 to 0.5, a sizable percentage (43%) of users replied that the tour length was not satisfactory, it was either too long or too short. In the second assignment, 37% of users replied that tour length was unsatisfactory. This may not seem like a large difference in unsatisfactory tour lengths between the two assignments but the important feature to note is how these figures are made up. For example, in assignment 1, 30% of users replied that the tour length was too long and only 13% said that it was too short. In assignment 2, only 13% of users replied that the tour length was too long whereas 24% said that the tour was too short. It could be argued that users were even more familiar with the browser tool in assignment 2 but the shift in pattern could not have been caused by users familiarity with the hypertext as users queries and hence tours, differed across assignments. We believe that the shift could only be caused by the changed set of values for μ as this was the only parameter to be modified between assignment 1 and assignment 2. After the first assignment, tours were made shorter by removing $\mu = 0.1$ and $\mu = 0.2$ from the set of values actually used and $\mu = 0.6$ was added. In relation to tour length, the most suitable threshold value seems to lie between $\mu = 0.3$ and $\mu = 0.4$ but until the tour generation algorithm is tested against more hypertexts this value cannot be regarded as universal.

Information coverage is based on what the user deems to be relevant or irrelevant on a tour with

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regard to their particular query. Trying to measure this characteristic exactly would be very difficult as it would be necessary to select all the nodes in the hypertext which were relevant to every user query. This is the same problem as faced in typical information retrieval experimentation where exhaustive relevance judgements on a collection of texts are ideal but not always available [12]. For this reason, it was decided to gauge information coverage based on user's replies to questions about the proportion of relevant nodes on the tour. A long tour is not necessarily better as it may contain a lot of information which is extraneous to the query thereby forcing the user to sift through all of the material in order to find the appropriate nodes. Likewise, even though a short tour may contain only those nodes which are relevant it may also omit several suitable nodes, thereby compelling the user to browse in order to find all the information relating to their query. Our task is to find a suitable mid-point between these two extremes. One pattern to notice in examining the user's replies to the question on information coverage is that as increases so does the number of users who replied that the tour nodes were highly relevant. Similarly, as μ increases, so does the number of users who replied that nodes visited outside the tour were relevant. This pattern adheres to the principle that as tours get shorter less irrelevant nodes are included in the tour. However, it also appears that some relevant nodes are being excluded from the tour. It seems that high threshold values do not lead to tours which contain enough information to satisfy the user's query. Likewise, when the tours were long, $\mu \epsilon \{0.1, 0.2\}$, the proportion of users replying that a high percentage of tour nodes were relevant was lower than when a high threshold value, $\mu \epsilon \{0.5, 0.6\}$, was used. By examining the results, it seems that when $\mu = 0.3$ the information coverage is enough to satisfy the users query but not too much that they are laden with material or too little that they have to go in search of it themselves.

In order to measure a third characteristic of guided tours, their connectivity, a scoring algorithm was devised which, using the link types between adjacent tour nodes, calculated a connectivity score for each generated tour in both assignments. The link types which were used to connect the nodes in the database were divided into three groups which represent how important each link type is deemed to be in providing a connected and logical path through the network of nodes. Most important are the link types which determine where each node should appear in the tour relative to its neighbours. Links in this category are *is_a, a_kind_of, consists_of* and *contains*. If two nodes are connected by any of these links then it is immediately apparent which one should come first in a tour. Second in terms of link strength are links which more loosely determine an order of precedence which include *precedes, has* and *facilitates*. Finaly are those links in which no attempt is made to establish the order in which links should be displayed.

Having thus ascertained the strengths of the various link types in a tour we then gave each generated tour a score based on its coherence. The formula to do this is based on assigning weights to each of the link categories; 3 for the first category, 2 for the second and 1 for the third. When all links in each tour have been taken into consideration the tour score is normalised by dividing by the total number of links in the tour. The following are the scores assigned to tours in each assignment. The scores are divided up into bands of 0.3, e.g. 0 to 0.3, 0.3 to 0.6, etc. and are given in Table 5.

μ value	Assign 1	Assign 2
0.0 – 0.3	8%	16%
0.3 – 0.6	28%	28%
0.6 – 0.9	43%	33%
0.9 – 1.3	15%	15%
1.3 – 1.6	5%	4%
1.6 – 3.0	1%	4%

Table 5. Connectivity scores for tours

In both assignments, the connectivity of most of the tours fell into the range 0.6 to 0.9. When these scores are compared with a control group of tours, we can see how ordering or sequencing the nodes on the tour using link types as outlined earlier, affects the connectivity of the tours. The control group was used to determine the connectivity scores which would be calculated without the logical ordering of nodes. More than 20% of the original user queries were taken as a sample for use in the control groups and tours were generated without paying attention to the link types described in section 3. The only criteria used for generating the control group tours were the individual nodes' similaritity to the query. The nodes in the control group tours were presented in decreasing order of node weight only. The results of

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this experiment can be seen in table 6 which compares connectivity scores between sequenced and unsequenced tours. Clearly, the overall scores are much lower for the control group than the assignments where sequencing of nodes was used.

μ value	User Sessions	Control Group
0.0 - 0.3	15%	63%
0.3 - 0.6	28%	21%
0.6 - 0.9	35%	7%
0.9 - 1.3	15%	3%
1.3 - 1.6	5%	2%
1.6 - 3.0	2%	4%

Table 5. Tour scores in user sessions v control

The figures in table 6 indicate that tours generated using the precedence ordering consistently obtain higher connectivity scores than those in the control groups suggesting that imposing a precedence order on a sequence of nodes improves their logical ordering.

By examining the patterns for each threshold value μ, it can be seen that the proportion of tours within each threshold value with connectivity scores above average generally increases as μ increases. This would indicate that the higher the value of μ the better. However, as μ increases the number of tours scoring below average also increases, e.g. 6% at $\mu = 0.1$ to 26% at $\mu = 0.6$. This indicates that as μ increases so does the number of low scoring tours. A suitable mid-point would seem to be where $\mu \approx 0.3$.

We cannot draw any definite conclusions just by examining users answers to the questions at the end of each session. However, we can gain some idea as to which type of tour is preferred by the users. From our users responses we see the tendency is towards short tours and then if necessary, deviate on their own. Our hypertext browser generated a recommended guided tour which users could follow if they chose and they could also deviate if they wished. In practice we found some of the user sessions (40%) contained no deviations from the recommended guided tour at all. However, on average, 7 deviations per session took place in the first assignment and 6 deviations per session in the second assignment. This suggests that users were using the hypertext browsing facility regularly in addition to following the guided tours.

6 Conclusions

Dynamically planning guided tours overcomes three problems with using hypertext in the following ways:

- *Getting lost:* Users don't need to worry about getting lost or confused in the hypertext as all they need to do is follow the tour which is generated in response to their query. If users want to digress and browse around the hypertext the option of returning to the tour at any time is always available.

- *Finding information:* When the user enters a search query in the form of a natural language statement it is matched to the nodes in the hypertext using standard information retrieval techniques. Unique hypertext characteristics such as connectivity and link types are also taken into account when determining which nodes should be included in the guided tour. By considering all characteristics of the hypertext we hope to incorporate the flexibility of browsing with the need to extract all relevant nodes.

- *Logical sequence of nodes:* When users are employing the hypertext as a learning aid it is important that there be a natural progression from the most basic information to the more complex so that the users do not become confused with the material. Our guided tours are planned so that the typed links between the nodes in the hypertext are considered in judiciously formulating the route. The most logical path through the network does not necessarily have to consist of nodes which are explicitly linked to one another but rather can be a combination of nodes selected from all parts of the hypertext. Selecting the nodes for inclusion is mainly an information retrieval task but planning the sequence of nodes depends on arranging the tour so that each node is positioned in the correct sequence relative to the other tour nodes.

User responses from nearly 1000 tours for 125 users have helped us refine our tour generation method. The present method generates a tour in response to a user's query irrespective of who the user is, their level of expertise or experience with the hypertext, and what he/she has seen already in the current or in previous sessions with

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the browser. The next step is to use this kind of information which is already stored in the log file to generate a user model and to use this to generate what we believe would be even more intelligently-planned dynamic guided tours. We are also considering ways of including relevance feedback during the tour traversal to dynamically re-compute a guided tour as has been done in [4]. We will also considerably expand the information coverage in the hypertext we use to allow us to involve an even larger population of end users.

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