

# Digital Libraries: Topical Outline

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# Introduction to Digital Libraries:

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- [Definitions](#): Some of the attempts made by various people to define a digital library.
- [Sample DLs](#): Illustrations of what is or may not be a digital library
- [Foundations](#): Introductory material related to digital libraries...
- [Scenarios and Perspectives](#): Various scenarios and perspectives that arise in a Digital Library context.

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# Definitions :

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- "The new digital libraries will have features not possible in traditional libraries, thereby extending the concept of library far beyond physical boundaries. They will provide innovative resources and services. One example is the ability to interact with information: rather than presenting a reader with a table of numbers, digital libraries allow users to choose from a variety of ways to view and work with the numbers, including graphical representations that they can explore. With the extensive use of hypertext links to interconnect information, digital libraries enable users to find related digital materials on a particular topic."  
([2001 PITAC Report](#), "Digital Libraries: Universal Access to Human Knowledge", p. 3)
- "Digital libraries are organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities."  
([Digital Library Federation](#))
- "Digital libraries are complex data/information/knowledge (hereafter information) systems that help: satisfy the information needs of users (societies), provide information services (scenarios), organize information in usable ways (structures), manage the location of information (spaces), and communicate information with users and their agents (streams)."  
(Edward A. Fox, July 1999, according to 5S Framework)
- "Digital library work occurs in the context of a complex design space shaped by four dimensions: community, technology, services and content"  
(Gary Marchionini and Edward A. Fox, "Progress toward digital libraries: augmentation through integration", pp. 219-225, guest editors' introduction to "Progress Toward Digital Libraries", eds. Gary Marchionini and Edward A. Fox, Special Issue, *Information Processing & Management*, 35(3), May 1999.)
- "The field of digital libraries deals with augmenting human civilization through the application of digital technology to the information problems addressed by institutions such as libraries, archives, museums, schools, publishers and other information agencies. Work on digital libraries focuses on integrating services and better serving human needs, through holistic treatment irrespective of interface, location, time, language and system. Although substantial collections may be created solely for the use of individuals, we consider sharable resources one of the defining characteristics of libraries. Libraries connect people and information; digital libraries amplify and augment these connections."  
(Gary Marchionini and Edward A. Fox, "Progress toward digital libraries: augmentation through integration", *Information Processing & Management*, 35(3):219-225, May 1999.)
- For a thoughtful discussion of definitions, approaches, and community perspectives on "digital libraries" see "What are digital libraries? Competing visions" by Christine L. Borgman, pp. 227-

244, in "Progress Toward Digital Libraries", eds. Gary Marchionini and Edward A. Fox, Special Issue, *Information Processing & Management*, 35(3), May 1999.

- "The Digital Library is:
  - The collection of services
  - And the collection of information objects
  - That support users in dealing with information objects
  - And the organization and presentation of those objects
  - Available directly or indirectly
  - Via electronic/digital means."

([The Scope of the Digital Library](#), Draft Prepared by Barry M. Leiner for the DLib Working Group on Digital Library Metrics, 1998)

- "Digital library is a concept that has different meanings in different communities. To the engineering and computer science community, digital library is a metaphor for the new kinds of distributed data base services that manage unstructured multimedia data. To the political and business communities, the term represents a new marketplace for the world's information resources and services. To futurist communities, digital libraries represent the manifestation of Wells' World Brain. The perspective taken here is rooted in an information science tradition." ([Research and Development in Digital Libraries by Gary Marchionini, 1998](#))
- "an organized data base of digital information objects in varying formats maintained to provide unmediated ease of access to a user community, with these further characteristics:
  - an overall access tool (e.g. a catalog) provides search and retrieval capability over the entire data base;
  - organized technical procedures exist through which the library management adds objects to the data base and removes them according to a coherent and accessible collections policy."
 (Peter Graham, Rutgers University Libraries, 1997)
- "Digital libraries are a set of electronic resources and associated technical capabilities for creating, searching, and using information. In this sense they are an extension and enhancement of information storage and retrieval systems that manipulate digital data in any medium (text, images, sounds; static or dynamic images) and exist in distributed networks. The content of digital libraries includes data, metadata that describe various aspects of the data (e.g., representation, creator, owner, reproduction rights), and metadata that consist of links or relationships to other data or metadata, whether internal or external to the digital library." ([1996 UCLA-NSF Social Aspects of Digital Libraries Workshop](#))
- Digital libraries are constructed -- collected and organized -- by a community of users, and their functional capabilities support the information needs and uses of that community. They are a component of communities in which individuals and groups interact with each other, using data, information, and knowledge resources and systems. In this sense they are an extension, enhancement, and integration of a variety of information institutions as physical places where resources are selected, collected, organized, preserved, and accessed in support of a user community. These information institutions include, among others, libraries, museums, archives, and schools, but digital libraries also extend and serve other community settings, including classrooms, offices, laboratories, homes, and public spaces." ([1996 UCLA-NSF Social Aspects of Digital Libraries Workshop](#))

- "Systems providing a community of users with coherent access to a large, organized repository of information and knowledge."  
([Clifford Lynch](#), 1995)
  - "systems providing a community of users with coherent access to a large, organized repository of information and knowledge. This organization of information is characterized by the absence of prior detailed knowledge of the uses of the information. The ability of the user to access, reorganize, and utilize this repository is enriched by the capabilities of digital technology"  
(adapted from [Interoperability, Scaling, and the Digital Libraries Research Agenda, report of the 1995 IITA DL Workshop](#))
  - "A library that has been extended and enhanced by the application of digital technology. Important aspects of the digital library that may be extended and enhanced include :
    - Collections of the library
    - Organization and management of the collections
    - Access of the library items and the processing of the information contained in the items
    - Communication of information about the items "(Terry Smith, UCSB, 1995)
  - "The generic name for federated structures that provide humans both intellectual and physical access to the huge and growing worldwide networks of information encoded in multimedia digital formats."  
([The University of Michigan Digital Library: This Is Not Your Father's Library](#), [Bill Birmingham](#), 1994)
  - "A digital library is a distributed technology environment which dramatically reduces barriers to the creation, dissemination, manipulation, storage, integration, and reuse of information by individuals and groups."  
([Edward A. Fox](#), editor, [Source Book on Digital Libraries](#), 1993, pg. 65)
  - "A digital library is a machine readable representation of materials which might be found in a university library together with organizing information intended to help users find specific information. A digital library service is an assemblage of digital computing, storage, and communicate machinery together with the software needed to reprise, emulate, and extend the services provided by conventional libraries based on paper and other material means of collecting, storing, cataloging, finding, and disseminating information."  
([Edward A. Fox](#), editor, [Source Book on Digital Libraries](#), 1993, pg. 65)
- 

## Digital Library related terms/glossary

(by Peter Graham, Rutgers University Libraries, 1997):

- digital archive: a digital library which is intended to be maintained for a long time, i.e. periods longer than individual human lives and certainly longer than individual technological epochs. (Sometimes formerly also "digital research library.")
- digital preservation: preservation of artifactual information by digitizing its image (e.g. scanning a manuscript page, digitally photographing a vase, or converting a cylinder recording to digital form).
- electronic preservation: preservation of information that is in digital (that is, electronic) form, i.e. the techniques associated with refreshing, migration and assurance of integrity.

## Digital Preservation techniques:

- Refresh: to copy digital information from one long-term storage medium to another of the same type, with no change whatsoever in the bit stream (e.g. from a decaying 800 bpi tape to a new 800 bpi tape, or from an older 5 1/4" floppy to a new 5 1/4" floppy).
- "Modified refreshing" is the copying to another medium of a similar enough type that no change is made in the bit pattern that is of concern to the application and operating system using the data, e.g. from an 800 bpi tape to a 1600 bpi tape or to a "square", cartridge, tape; or from a 5 1/4" floppy disk to a 3 1/2" floppy disk.
- Migrate: to copy data, or convert data, from one technology to another, whether hardware or software, preserving the essential characteristics of the data; generally forward in time. (At the moment, it is recognized, this final qualifier begs many questions.) Examples: conversion of XyWrite w/p files to Microsoft Word; conversion of ClarisWorks v3 spreadsheet files to Microsoft Excel v4 files; conversion of binary tape images of survey research

multi-punched tab cards to a data base format; copying an 800 bpi tape file to a sequential disk file; converting a DOS FoxPro data base to a Visual Basic database for Windows 95; converting a PICT image to a TIFF image; converting a ClarisWorks for Windows v4 w/p file to a Macintosh ClarisWorks v4 file.

Examples can be given, as here, for cases known to be required; the longer term preservation problem is to prepare for forward migrations when the future technologies are unknown.

- Emulate: (find and use better Comp SCI terms here, probably) in hardware terms, the creation of software for a computer that reproduces in all essential characteristics (as defined by the problem to be solved) the performance of another computer of a different design. Computers may emulate earlier computers in order to provide backward compatibility, or may emulate a future computer in order to provide a software development environment while the newer computer is still being fabricated.

In software preservation terms, the creation of software that analyzes the software environment of

a document such that it can provide a user interface to the document that substantially reproduces the essential characteristics of the document as it was created by its originating software.

- Document: (use sense that Apple began to use, with Macintosh; anything manipulated by an application; find their definition and build on it. Note Dublin Core [and other] use of "document like object").
- Authenticate: of users, to verify that network users are in fact who they identify themselves to be; of documents, to validate the integrity of a document with respect to its original authorized creation.
- Authentication: (of a resource--i.e. of data, not people)
- Authenticity: (of a resource--i.e. of data, not people)
- Integrity: synonym of authenticity (of a resource--i.e. of data, not people)

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# Sample DLs: Illustrations of what is or may not be a digital library

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## Sites to consider that demonstrate DL functions

- [Amazon](#)
- [Pricewatch](#)
- [PriceScan](#)
- [Internet Movie Database](#)
- [Web Characterization Repository](#)
- [ETDs](#)  
and the experimental [ETD union collection](#)
- [NCSTRL](#) (being redone)

## Sites related to NSDL

- [NSDL](#)
- [SMETE.ORG](#)
- [DLESE](#)
- [iLumina](#)
- [CSTC](#)  
and a [test version](#)
- [ResearchIndex](#)
- [CITIDEL](#)
- [ENC](#)
- [MERLOT](#)
- [Mathwright](#)
- [MathDL](#)

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ELECTRONICS

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CELL PHONES &  
SERVICEHEALTH  
& BEAUTY

CARS

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▶ TOP SELLERS

▶ FRIENDS &amp; FAVORITES

▶ FREE E-CARDS

▶ FRIDAY SALE

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Go shopping



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- [Tools & Hardware](#)
- [In Theaters](#)
- [DVD](#)
- [Computer & Video Games](#)
- [Baby & Baby Registry](#)
- [Toys & Games](#)
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**New Computer Components**

<b>Systems</b>	<b>CPU</b>	<b>Memory</b>	<b>Storage</b>	<b>Multimedia</b>	<b>Input</b>
PC - Windows	Motherboards	System	Hard Drives	Multimedia	Keyboards
PC - Apple	Motherboard	Notebook	CDRom Drives	Video Cards	Mice
PC - Kits	Combos	Printer	CD Recorders	Video Capture	Scanners
Notebooks	Motherboard	Flash Card	DVD Drives	Sound Cards	WebCams
Hand Held	Accessories	Video	DVD Accessories	Music Hardware	Digitizers/Tablets
Hand Held	Processors - PC		Tape Drives		Bar Code
Accessories	Processor		Removable		
Servers	Accessories	<b>I/O</b>	Floppy Drives	<b>Other</b>	<b>Software</b>
Server	Processors -	Controller	Magneto Optical	MP3 Players	DVD
Accessories	Mobile	Cards	Media	MP3	Business
	Cases	Serial Cards	Media Other	Accessories	Operating Systems
<b>For</b>	Fans		<b>Networking</b>	Desk	Game
<b>Notebooks</b>	Case Power		Modems	Accessories	Networking
Notebook	Supply		Network Cards	Backup	
Battery			Networking	Supplies	
Notebook	<b>Output</b>		Other	Cables	
Drives	Monitors			Game	
Notebook	Printers			Hardware	
Modems	Plotters			Paper Products	
Notebook	Printer				
Accessories	Accessories				
	Presentation				

**System Memory Links -****Quotes @4:45 - 8/25****See Brands**

\$1952 - 4GB  
 \$550 - 2GB  
 \$197 - 1GB  
 \$69 PC2400 DDR 256MB  
 \$39 - PC2400 DDR 128MB  
 \$145 PC2100 DDR 512MB  
 \$31 - PC2100 DDR 256MB  
 \$13 - PC2100 DDR 128MB  
 \$194 - PC1600 DDR 512MB  
 \$35 - PC1600 DDR 256MB  
 \$15 - PC1600 DDR 128MB  
 \$40 - PC1600 DDR 64MB  
 \$72 PC150 512MB

\$24 - PC150 256MB  
 \$14 PC150 128MB  
 \$28 PC133 512MB  
 \$16 - PC133 256MB  
 \$8 - PC133 128MB  
 \$5 - PC133 64MB  
 \$28 - PC100 512MB  
 \$17 - PC100 256MB  
 \$8 - PC100 128MB  
 \$5 - PC100 64MB  
 \$39 - FPM 128MB 60ns  
 \$26 FPM 64MB 60ns  
 \$110 - EDO 256MB 50ns

\$39 - EDO 128MB 60ns  
 \$17 EDO 64MB 60ns  
 \$298 - RDRAM 512MB  
 \$77 RDRAM 256MB  
 \$34 RDRAM 128MB  
 \$16 - RDRAM 64MB  
 \$1 - Cache  
 \$59 - Apple G4 PC133 512MB  
 \$29 - Apple G4 PC133 256MB



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Calculators, Copiers, Label Makers, Fax Machines, Shredders, Typewriters

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Exercise Equipment, Golf

### [Video Games](#)

Nintendo 64, Gameboy and SNES, Sony Playstation, Sega Dreamcast and Saturn

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Breitling, Cartier, Casio, Movado, Omega, Rolex, Swiss Army, TAG Heuer, More...

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### Tops at the Box Office

- 1 [American Pie 2](#)
- 2 [Rush Hour 2](#)
- 3 [Rat Race](#)
- 4 [The Others](#)
- 5 [The Princess Diaries](#)

[more](#)

### Opening this Week

- [Curse of the Jade Scorpion](#)
- [Ghosts of Mars](#)
- [Jay and Silent Bob Strike Back](#)
- [Bubble Boy](#)
- [Summer Catch](#)
- [Wet Hot American Summer](#)

[trailers](#)

### Coming Soon

- [O](#)
- [Jeepers Creepers](#)
- [Wakin' Up in Reno](#)
- [The Musketeer](#)
- [Rock Star](#)
- [Soul Survivors](#)



## The Internet Movie Database

Visited by 8 million movie lovers each month!

Prepare yourself for the biggest, best, most award-winning movie site on the planet. First time user? Roll up your sleeves and [click here](#).

### TOP 5 DVDs - UP TO 25% OFF

Updated Hourly! Save up to 25% on these top-selling DVDs at the Amazon.com [DVD](#)

store... 1. [Shrek](#), 2. [Hannibal](#), 3. [Star Wars - Episode I, The Phantom Menace \(English/ Spanish\)](#), 4. [Snow White and the Seven Dwarfs](#), 5. [Willow \(English/Spanish\)](#) .... (more [DVDs](#), [soundtracks](#))



### Movie Showtimes Near You!

You need showtimes? We've got showtimes! Type in your city/state (or

ZIP code) in our **Showtimes** link for other local US movie listings opening this week:

### U.S. Movie Showtimes

**FREE!**  
**Weekly Showtimes**  
via e-mail

Enter your ZIP code below:

Showtimes email service provided by **Amazon.com** and **IMDb**

**Showtimes on IMDb:**  
Powered by Zap2it

Day:

In:

Enter ZIP code or Town, State

### Movie and TV News

Fri August 24, 2001:

Studio Briefing

- [Movie Reviews: Ghosts Of Mars](#)
- [Movie Reviews: Bubble Boy](#)
- [Movie Reviews: The Curse Of The Jade Scorpion](#)

Celebrity News

- [Harrison Ford Gets Dumped](#)
- [No More Beemers For Bond](#)
- [Winslet To Replace Ill Ryder?](#)

Celebrity Interviews/Articles

# Web Characterization Repository



Web Characterization Activity

## Search Repository

[Help](#)

Search :

## Browse Listing of Resources

[Help](#)

[Complete Listing](#)  
(Publications, Tools and Traces)

[All Publications](#)

[All Tools](#)

[All Traces](#)

[Conferences](#)

[Journals](#)

[Technical Reports](#)

[Theses/Dissertations](#)

[Drafts](#)

[Books](#)

[Other](#)

[General tools](#)

[Client logs](#)

[Server logs](#)

[Proxy logs](#)

[Network traffic](#)

[Logs of search engines](#)

[Miscellaneous logs](#)

## Add New Resource

[Help](#)

[Read the procedure](#) on submitting resources and then ...

## Log File Formats

[Help](#)

## ETD Digital Library

# Networked Digital Library of Theses and Dissertations (NDLTD)

See also [NDLTD project page](#) and [member contact information](#).

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## Digital Library of ETDs (Electronic Theses and Dissertations)

### Official University Nodes in the NDLTD

- [Australian project](#)
- [Concordia University](#)
- [Humboldt-University of Berlin](#)
- [M.I.T.](#)
- [National Documentation Centre \(NDC\), Greece](#)
- [National Sun Yat-sen University in Taiwan](#)
- [North Carolina State University](#)
- [OhioLINK project](#)
- [Rhodes University](#)
- [University of Florida](#)
- [University of Iowa](#)
- [University of Kentucky](#)
- [University of North Texas](#)
- [University of Texas at Austin](#)
- [University of Virginia](#)
- [University of Tennessee, Memphis](#)
- [Universiteit Utrecht](#)
- [Universitat Politecnica de Valencia](#)
- [University of Waterloo](#)
- [Uppsala University](#)

### Other Sites with ETDs

- [DOE Environmental Sciences Division](#)
- [Konstanzer Online-Publikations-System](#)  
(*in German*)
- [National Library of Canada](#)
- [Theological Research Exchange Network \(TREN\)](#)
- [UMI](#)
- [University of Michigan](#)
- [University of Stuttgart](#)
  
- [Independent ETDs](#)

- [Virginia Tech](#)
- [West Virginia University](#)
- [Worcester Polytechnic Institute \(WPI\)](#)

## Other NDLTD Sites with ETDs

- [Dissertation.com](#)
  - [Diplomica.com](#)
- 

## Federated Search for NDLTD

Please try out the following working prototype federated search service of NDLTD. See also the [online article](#). Report suggestions to James Powell at [jpowell@vt.edu](mailto:jpowell@vt.edu)

- [Federated Search Demonstration](#)
- 

## Collection Highlights - Notable ETDs

- [Notable ETDs](#)
  - [Statistics and other information](#)
  - Please send recommendations regarding other ETDs or statistics you believe will be of interest (to [fox@vt.edu](mailto:fox@vt.edu)).
- 

## Related Sites

- [NDTLD Project](#): articles, joining, objectives, members, ...
  - [Submission Instructions](#) (for VT ETDs)
-



# Electronic Thesis/Dissertation OAI Union Catalog

[Home](#)  
[Search](#)  
[Browse](#)  
[About](#)  
[How to Join](#)

## Related Sites

- [NDLTD](#)
- [Theses.org](#)
- [Open Archives Initiative](#)

## Current Sites

1. *PhysNet*
2. *Virginia Tech*
3. *Humboldt- Universität zu Berlin*
4. *Gerhard- Mercator- Universität Duisburg*
5. *Technische Universität Dresden*

Send comments to  
[etdunion@oai.dlib.vt.edu](mailto:etdunion@oai.dlib.vt.edu)

Last updated on : 23 July 2001

## Some Recent Additions to our Collection

- Bionomics of *Ochlerotatus triseriatus* Say (Diptera: Culicidae) and *Aedes albopictus* Skuse (Diptera: Culicidae) in emerging La Crosse virus foci in Virginia , *Barker, Christopher Michael, Virginia Polytechnic Institute and State University, 2001-08-22* [ [More Info](#) ]
- Financial Liberalization, Competition and Sound Banking: Theoretical and Empirical Essays, *Chen, Xiaofen, Virginia Polytechnic Institute and State University, 2001-08-21* [ [More Info](#) ]
- Characterization of Spin Coated Polymers in Nano-environments as a Function of Film Thickness, *Beck, Catherine Keel, Virginia Polytechnic Institute and State University, 2001-08-21* [ [More Info](#) ]

## Quick Search

Query :


## Quick Browse

Institution :

Year :

Sort By :

*Note: This is purely an experimental system !*

	Networked Computer Science Technical Reference Library		
	<a href="#">Search Collection</a>	<a href="#">Help for Users</a>	<a href="#">Submit to CoRR</a>
	<a href="#">Browse Collection</a>	<a href="#">About NCSTRL</a>	<a href="#">Open Archives</a>
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NOTICE: Due to end of funding support this site will be shut down on September 30, 2001. Until that time, this site is being maintained on a legacy basis and support for it is minimal. As a result, some of the functionality is limited.

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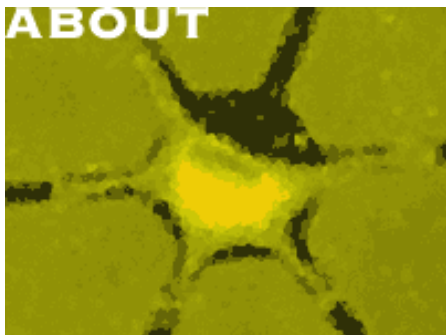
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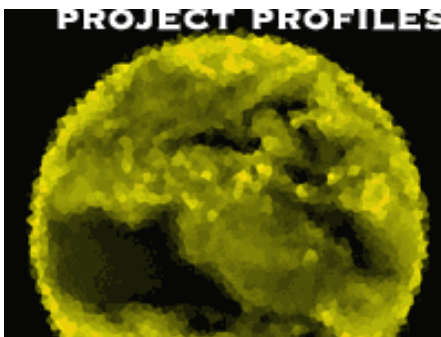
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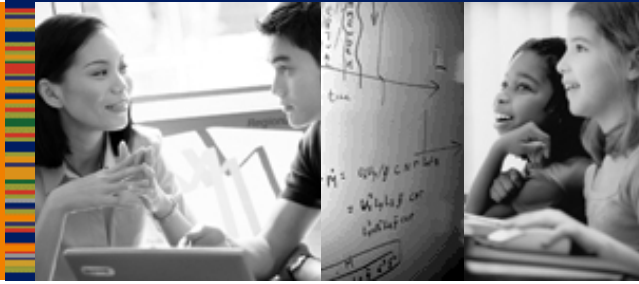


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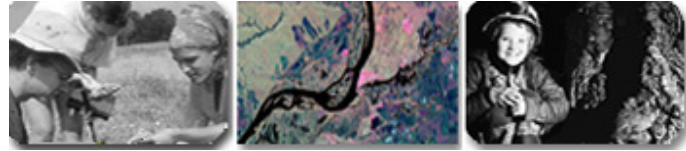
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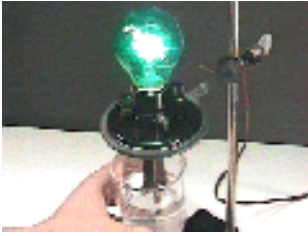
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*Last updated : 22 March 2001*



The CSTC is partially funded by the National Science Foundation (DUE-9752190) and by the Association for Computing Machinery Education Board.



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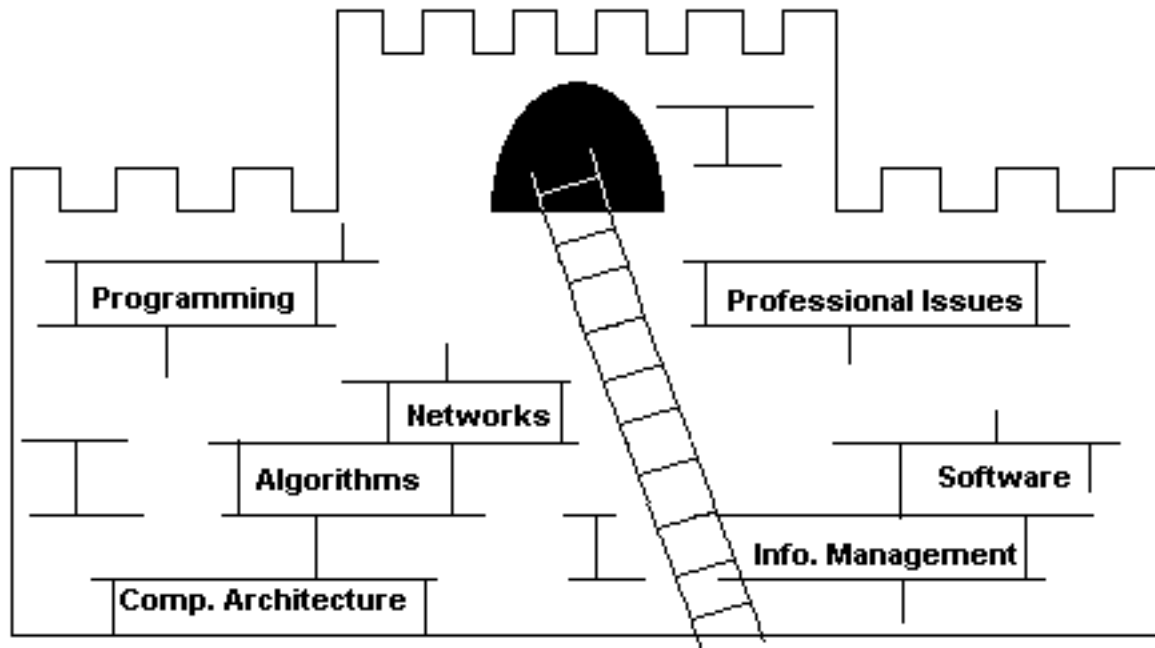
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The **Cafe** is our meeting room where we explore the art that blends mathematics and science with computers and magic.

Welcome, students, teachers, home schoolers, and all who prize mathematics! Have a cup of Java, relax and enjoy!

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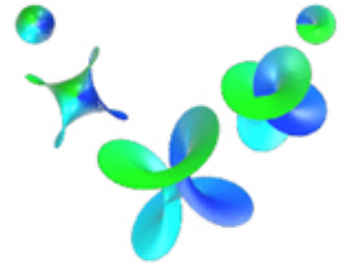
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# Welcome to MathDL

## The Mathematical Sciences Digital Library



The Mathematical Sciences Digital Library is an online resource managed by the Mathematical Association of America with funding by the National Science Foundation. The Library is hosted by the Math Forum. The site provides online resources for both teachers and students of collegiate mathematics, including

- A new MAA publication, the Journal of Online Mathematics and its Applications ([JOMA](#)).
- A catalog of mathematics [commercial products](#), complete with editorial reviews, reader ratings and discussion groups.
- [Digital Classroom Resources](#), a collection of mathematics instructional material with authors' statements and reader reviews.

The image above was contributed by the Communications in Visual Mathematics Project.



# Foundations (see Lesk Ch. 1, 8):

---

- [As We May Think](#) by Vannevar Bush - the visionary article that helped motivate early work on digital libraries, hypertext and information retrieval
  - 1996 UCLA workshop (focusing on user perspectives):
    - [Introduction](#)
    - [information life cycle](#)
    - [Artists](#)
    - [Business Records as Artifacts](#)
    - [Health-Information Systems](#)
  - 1995 IITA workshop: [Definitions and Roles of Digital Libraries](#)
  - [Digital Libraries: Issues and Architectures](#)
  - [Digital Library: Gross Structure and Requirements: Report from a March 1994 Workshop.](#)
- 

## Pedagogy:

We recommend that the above items be skimmed to obtain a general background regarding digital library research, development, and practice. Please also read chapters 1 and 8 of Dr. Lesk's book.

---

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# SOCIAL ASPECTS OF DIGITAL LIBRARIES

[UCLA-NSF Social Aspects of Digital Libraries Workshop](#)

Invitational workshop held at UCLA, February 15-17, 1996

FINAL REPORT TO THE

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Award number 9528808

Principal Investigator:

[Christine L. Borgman, Department of Information Studies](#)

Co-principal investigators:

[Marcia J. Bates, Department of Information Studies](#)

[Michele V. Cloonan, Department of Information Studies](#)

[Efthimis N. Efthimiadis, Department of Information Studies](#)

[Anne J. Gilliland-Swetland, Department of Information Studies](#)

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[Anthony B. Maddox, Department of Education](#)

[Graduate School of Education & Information Studies](#)

University of California, Los Angeles

November, 1996

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# Interoperability, Scaling, and the Digital Libraries Research Agenda:

A Report on the May 18-19, 1995

IITA Digital Libraries Workshop

August 22, 1995

Clifford Lynch ( [clifford.lynch@ucop.edu](mailto:clifford.lynch@ucop.edu) )

Hector Garcia-Molina ( [hector@db.stanford.edu](mailto:hector@db.stanford.edu) )

*Converted to HTML using GradStudentWare 2.2*

*Contact [Christian Mogensen](#) with bug reports.*

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## Introduction



# Digital Libraries: Issues and Architectures

*Peter J. Nürnberg*

*Richard Furuta*

*John J. Leggett*

*Catherine C. Marshall*

*Frank M. Shipman III*

Center for the Study of Digital Libraries

Texas A&M University

College Station, TX 77843

USA

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## ABSTRACT

The research field of digital libraries must be viewed as a union of subfields from a variety of domains combined with new research issues in order to realize its full potential. A clear exposition of the research issues involved has not yet been given. Most approaches to building digital library systems have thus far been limited to addressing specific digital library problems as variations of problems from other fields. This paper presents a taxonomy of digital library elements. Consideration of the elements in this taxonomy helps suggest a variety of issues. Example elements and some issues they suggest are used to populate the taxonomy. The paper continues by presenting a general digital library system architecture. Issues suggested by the taxonomy are shown to have implications at many levels of digital library system architectures for both design and implementation. This is illustrated by considering the implications of one issue (personalizing presentations) at several architectural levels and in the context of a set of current technologies.

**Keywords:** digital library issues, digital library architecture, databases, physical libraries, World Wide Web

## INTRODUCTION

The emerging field of digital libraries brings together participants from many existing areas of research. Currently, the field lacks a clear agenda independent of these other areas. It is tempting for researchers to think that the field of digital libraries is a natural outgrowth of an already known field. From a database or information retrieval perspective, digital libraries may be seen as a form of federated databases. From a hypertext perspective the field of digital libraries could seem like a particular application of hypertext technology. From a wide-area information service perspective, digital libraries could appear to be one use of the World Wide Web. From a library science perspective, digital libraries might be seen as continuing a trend toward library automation. There is some truth to

# Digital Library: Gross Structure and Requirements: Report from a March 1994 Workshop

Henry M. Gladney[1], Edward A. Fox[2], Zahid Ahmed[3], Ron Ashany[4], Nicholas J. Belkin[5], and Maria Zemankova[6]

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*[2] Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24601-0106, fox@fox.cs.vt.edu,*

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*[5] Rutgers University, New Brunswick, New Jersey, belkin@pisces.rutgers.edu,*

*[6] Mitre Corporation, McLean, Virginia 22102, mzemanko@mitre.org*

## Abstract

At the IEEE CAIA'94 Workshop on Intelligent Access to On-Line Digital Libraries we began discussing requirements and architecture for digital library systems. This paper provides a first summary of the results of our deliberations, analysis, and synthesis.

We consider the context, definitions and characteristics of digital libraries and then propose using an architecture for such distributed computing services built on the concepts of resource managers and application enablers. Our taxonomy for digital libraries calls for a base of file systems and database managers, a storage subsystem for library items (implemented as resource managers), and a higher layer of document managers (implemented as application enablers). Examples of the latter include Mosaic or a folder manager.

Many classes of modules are needed to build these systems. For a particular situation, it is essential to identify the requirements. As a guide, we outline some of the requirements relating to the document storage services and to catalogs that help with access. We conclude with discussions of document markup, links, interchange, and a reminder to build upon the lessons learned with previous libraries and

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- [Conferences/Workshops](#): Links to various conferences/workshops that have been held in the recent past or will be held in the near future.
- [Journals](#): Digital Library related journal information with links.
- [Repositories & Bibliographies](#): contains information and links to some of the repositories maintained by various organizations such as the [D-Lib Magazine](#).
- [Books](#): Some books that contain valuable information on Digital Libraries (along with links to some publishers)

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- D-Lib Magazine articles on DLI-2 by NSF etc.:
  - [FY 1999 Awards - S. Griffin](#)
  - [Commentary on DLI-2 - M. Lesk](#)
  - [NSF/JISC Int'l Initiative - N. Wiseman, C. Rusbridge, S. Griffin](#)
- [Selected abstracts of IIS awards \(including some DLI-2\)](#)
- Calls:
  - [NSF9863 - Digital Libraries Initiative - Phase 2 \(February 20, 1998\)](#)
  - [Addendum - Special Emphasis: Planning Testbeds and Applications for Undergraduate Education within the Digital Libraries Initiative - Phase 2](#)
  - [NSF996 - International Digital Libraries Collaborative Research \(November 9, 1998\)](#)

## DLI-1

- DLI-1 home page at [NSF](#) and older one at [U. Illinois](#)
- [DLI-1 publications](#)
- [Carnegie Mellon University](#)
- [Stanford University](#)
- [University of California at Berkeley](#)
- [University of California at Santa Barbara](#)
- [University of Illinois](#)
- [University of Michigan](#)

[Library of Congress](#) and its [American Memory Project](#)

Los Alamos and U. Ghent, SFX: [paper](#) and articles in D-Lib Magazine: parts [1](#), [2](#), [3](#); [OpenURL Framework](#) (and [NISO standard effort](#))

[NARA](#) - National Archives and Records Administration

NASA [JSC Digital Image Collection](#)

## **NSDL (National Science, Mathematics, Engineering, and Technology Education Digital Library)**

### Related Sites and Projects:

- [Under Construction NSDL site](#)
  - [DLI-2 Planning Testbeds and Applications for Undergraduate Education](#)
  - [SMETE-Lib Study - NSF Science Mathematics, Engineering and Technology Education Digital Library reports](#)
  - [Funded Projects](#)
  - SMETE Information Portal: <http://www.smete.org>
  - [NEEDS - National Engineering Delivery System](#)
  - [Project Kaleidoscope](#)
  - Geoscience: [Call](#); [DLESE](#) (Digital Library for Earth System Education); [Windows to the Universe](#)
  - [ODU project](#) (including buckets)
  - U. Texas Austin: [Technology for Education 2000](#); [Virtual Multimedia Exams in Physical Anthropology](#); [High Res X-ray CT \(Computed Tomography\) Facility](#)
  - [Computer Science Teaching Center \(CSTC\)](#)
- 

## **Selected International Efforts**

Australia: [National Library DL Initiatives](#)

**[Bibliotheca universalis](#)**: (G7)

[British Library DL Programme](#)

[CIDL](#) - Canadian Initiative on Digital Libraries

**Electronic Theses and Dissertations Initiative:** [NDLTD project](#), [Collection](#), [Submission Instructions](#)

**[ERCIM](#)**: [DL initiative](#) (DELOS)

**International Digital Libraries Association:** [IDLA home page](#)

International Fed. of Library Associations and Institutions - [IFLA](#): [page pointing to DL info](#)

## Japan:

- [Workshops - DLnet](#)
- National Museum of Ethnology - [MINPAKU](#): [Virtual Tour](#)
- [Kobe U.](#): [Digital Library Search](#), [TITAN Search using WWW](#)
- [Tokyo Inst. of Technology](#): [Library](#)
- [Kyoto U.](#): [Digital Library](#)
- [NAIST](#): [Digital Library](#)
- [ULIS](#): [Digital Library](#), [Multilingual HTML](#), [Multilingual folk tales](#)
- [University of Tsukuba](#): [Digital Library](#)

[MeDOC](#): (German Online Computer Science Library)

NSF-EU Working Groups and Meetings: [home page](#)

Singapore Network: [SINGAREN](#)

[UK Electronic Library Programme](#) including a project on preservation: [New Cedars Project: CURL Exemplars in Digital Archives](#) and a 13M record searchable OPAC called [COPAC](#); [Centre for DL Research](#) (U. Southampton); De Montfort U. former [International Institute for Electronic Library Research](#)

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## Selected Publisher / Information-Distributor Projects:

- [ACM DL](#)
  - [ProQuest \(UMI\)](#) and its [Digital Dissertations](#)
  - [Elsevier Science \(ScienceDirect, ...\)](#)
  - [IDEAL](#) (International Digital Electronic Access Library)
  - [IEEE-CS DL](#)
  - [OCLC](#) FirstSearch Electronic Collections Online
  - [Springer's Forum for Science](#) (The LINK Online Libraries)
-

## Industrial Projects:

- [NEC: ResearchIndex \(CiteSeer\)](#)
  - [OCLC Research Projects](#)
- 

## Virginia Tech Projects:

- [Interactive Courseware on Digital Libraries](#) (this site itself is a part of it)
  - **Interactive Learning with a Digital Library in CS** <http://ei.cs.vt.edu/>
    - Interactive Learning with a Digital Library in CS arch <http://ei.cs.vt.edu/~cs5604/Adv/Adv-ILDLCS.html>
    - Courseware <http://ei.cs.vt.edu/courses.html>
    - [Project Overview](#) (for FIE'96, in PDF)
    - [Project Interim Report](#), Oct. 1996, PDF
    - [Project Report for NSF EI PI Meeting](#), Nov. 1996, PDF
  - **Envision (CS literature)** <http://ei.cs.vt.edu/~cs5604/Adv/Adv-Envision.html>
    - Envision report <http://ei.cs.vt.edu/papers/ENVreport/final.html>
  - **CODER** <http://ei.cs.vt.edu/~cs5604/Adv/Adv-CODER.html>
  - **MARIAN**
    - [home page](#)
    - system <http://opac3.cc.vt.edu/htbin/marian>
    - old overview <http://ei.cs.vt.edu/~cs5604/Adv/Adv-MARIAN.html>
  - [CSTC - Computer Science Teaching Center](#) and related effort
  - [CRIM - Curriculum Resources Interactive Multimedia](#)
  - [W3C Web Characterization Repository](#) (of logs, traces, tools, papers)
  - Virginia Tech DL Superstorage Research, using [VT-PetaPlex-1](#), a [PetaPlex](#) system from [Knowledge Systems Inc.](#) with at least 100 processors and 2.5 terabytes
- 

## Approaches to DL:

- Build upon existing electronic materials
  - Netlib (numerical analysis) <http://www.netlib.org/> and its search: [http://www.netlib.org/utk/misc/netlib\\_query.html](http://www.netlib.org/utk/misc/netlib_query.html)
- Build upon publishers collections
  - AAAS - Science Online <http://www.aaas.org/>

- ACM DL <http://www.acm.org/dl/>
- ACS (Chemistry) - Online <http://www.acs.org/>
  - CORE Overview <http://ei.cs.vt.edu/~cs5604/DL/DL2.html>
  - D-Lib Magazine, Dec. 1995, Making a Digital Library, Chemistry Online Retrieval Experiment <http://www.dlib.org/dlib/december95/briefings/12core.html>
  - CORE at OCLC <http://www.oclc.org/research/publications/arr/1994/part2/xscepter.htm>
- Elsevier
  - ScienceDirect <http://www.elsevier.nl/>
  - TULIP (material science & engineering) homepage <http://www.elsevier.nl/inca/homepage/about/resproj/tulip.shtml>
    - With universities + OCLC
- [Highwire Press](#)
- [IEEE](#)
- [IEEE-CS DL](#)
- [JSTOR](#)
- Commercial services and systems
  - IBM <http://www.software.ibm.com/is/dig-lib/>
    - Version 2 <http://www.software.ibm.com/is/dig-lib/v2factsheet/>
    - collection treasury <http://www.software.ibm.com/is/dig-lib/treasury/>
    - images - QBIC <http://www.qbic.almaden.ibm.com/>
    - news archive <http://www.software.ibm.com/is/dig-lib/newsarchive/>
- Enhance WWW (hypertext):
  - HyperWave <http://www.hyperwave.de/>
  - HyperWave [information server](#)
  - HyperWave author <http://www2.iicm.edu/hyperwave/author>
  - HyperWave author features <http://www2.iicm.edu/hyperwave/author/features.html>
  - HyperWave author specs <http://www2.iicm.edu/hyperwave/author/specifications.html>
  - Harmony <http://www2.iicm.edu/harmony>
  - Harmony screens <http://ei.cs.vt.edu/~cs5604/Adv/Adv-Harmony.html>
  - Amsterdam model <http://ei.cs.vt.edu/~mm/gifs/Amsterdam-hm.html>
- Community network multimedia history
  - BEV <http://www.bev.net>
  - BEV History <http://history.bev.net/bevhist/>
    - Timeline <http://history.bev.net/bevhist/historyBase/mainTimeline.html>
    - [Screen for Spring 1992](#)
    - [Screen for Article](#)
- Discipline - Greek Literature <http://www.perseus.tufts.edu/>
  - Evaluation - [article in TOIS](#)
- Discipline - Computer Science

- Technical reports
  - [WATERS](#) - through 1995
  - CSTR <http://WWW.CNRI.Reston.VA.US/home/cstr.html>
  - NCSTRL <http://www.ncstrl.org/>
    - Search results, Search results abstract
    - Doc. thumbnails, Doc. page 1
  - CoRR: <http://xxx.lanl.gov/archive/cs/intro.html>
- Ptrs
  - DLs for CS <http://fox.cs.vt.edu/DLCS.html>
  - Results page, document page from search
- Genre - ETDs - electronic theses and dissertations
  - Virginia Tech <http://etd.vt.edu/>
    - Submission form <http://scholar.lib.vt.edu/ETD-db/ETD-submit/login>
    - Approval form <http://etd.vt.edu/submit/ETDapp09-00.pdf>
    - Letter to students <http://etd.vt.edu/guidelines/>
    - Standards <http://etd.vt.edu/help/multimedia.html>
  - Collection <http://www.theses.org>
    - [Federated Search](#)
  - Project - Networked Digital Library of Theses and Dissertations <http://www.ndltd.org>
    - Brief description <http://www.ndltd.org/info/descr.htm>
    - D-Lib Magazine Overview September 1996  
<http://www.dlib.org/dlib/september96/theses/09fox.html>
    - D-Lib Magazine Update September 1997  
<http://www.dlib.org/dlib/september97/theses/09fox.html>
    - D-Lib Magazine Federated Search September 1998  
<http://www.dlib.org/dlib/september98/powell/09powell.html>
    - FIPSE (US Dept. of Education) funding of 1996-1999 project
      - proposal abstract <http://www.ndltd.org/support/fipseabs.htm>
      - proposal full-text <http://www.ndltd.org/support/fipse10.pdf>
      - project final report ([PDF](#))

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Please send comments/suggestions to [Ed Fox](#).

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# DIGITAL LIBRARIES INITIATIVE

a community of  
researchers and  
agencies working  
together to bring the  
world's knowledge  
to your desktop

Digital Libraries Initiative  
Phase 2 HOME

Digital Libraries Initiative  
Phase 1 (1994-1998)

Search

## Highlight

**[Presentations from the DLI2/IMLS Principal Investigators Meeting, Roanoke, VA, June 28, 2001](#)**

**[DLI2 LIST- a mailing list archival site for the digital libraries community](#)**

**[PITAC renewed; three new reports available](#)**

## Features

**[DLI2 Funded Projects](#)**

**[DLI2 International Projects](#)**

**[Special Projects Program](#)**

**[Funded Workshops](#)**

## Related Information

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[Reports](#)

[Publications](#)

[National SMETE Digital Library](#)

[DL Resources](#)

[D-Lib Magazine](#)

[e-Culture Newsletter](#)

## Sponsoring Agencies and Programs

National Science Foundation ([NSF](#))

[Digital Libraries Initiative](#)

Defense Advanced Research Projects Agency ([DARPA](#))

[Information Technology Office](#)

National Library of Medicine ([NLM](#))

[Extramural Programs](#)

Library of Congress ([LOC](#))

[Digital Library Initiatives](#)

National Endowment for the Humanities ([NEH](#))

[Digital Library Initiative](#)

National Aeronautics & Space Administration ([NASA](#))

## In Partnership with

[National Archives and Records Administration](#) (NARA)

[Smithsonian Institution](#) (SI)

[Institute of Museum and Library Services](#) (IMLS) [IMLS PROJECTS](#)

## [NSF Contact](#)

## [Agency Contacts](#)

**Digital Libraries Initiative Phase Two** is a multiagency initiative which seeks to provide leadership in research fundamental to the development of the next generation of digital libraries, to advance the use and usability of globally distributed, networked information resources, and to encourage existing and new communities to focus on innovative applications areas.

Since digital libraries can serve as intellectual infrastructure, this Initiative looks to stimulate partnering arrangements necessary to create next-generation operational systems in such areas as education, engineering and design, earth and space sciences, biosciences, geography, economics, and the arts and humanities. It will address the digital libraries life cycle from information creation, access and use, to archiving and preservation.



# FUNDED PROJECTS

[DLI2 HOME](#)

[DLI1 \(1994-1998\)](#)

[SEARCH](#)

The following projects do not constitute a complete list of awardees from the Digital Libraries Initiative-Phase 2. Announcements of additional grant recipients will be made as they become official.

Projects are ordered alphabetically by institution

## **University of Arizona**

Project Web Site: **[High-Performance Digital Library Classification Systems: From Information Retrieval to Knowledge Management](#)**

Project Start Date: May 1, 1999

Project End Date: April 30, 2002

Expected Total Amt. \$499,998 (Estimated)

[NSF Awards Abstract](#)

[Hsinchun Chen](#) Principal Investigator

[Artificial Intelligence Lab](#), [Department of Management of Information Systems](#)

[Project Summary](#) (pdf)

Related Links:

["Beyond Geography: Mapping Unknowns of Cyberspace"](#) (Digital Library Research in the *New York Times* (9/30/1999))

[OOHAY Project for Digital Libraries](#)

[Spiders are Us](#)

[Information Analysis and Visualization](#)

[Medical Informatics](#)

## **University of California Berkeley**

Project Web Site: **[Re-inventing Scholarly Information Dissemination and Use](#)**

Project Start Date: April 1, 1999

Project End Date: March 31, 2004

Expected Total Amt. \$5,000,000 (Estimated)

[NSF Award Abstract](#)

[Robert Wilensky](#), Principal Investigator

[David Forsyth](#), Co-Principal Investigator

[Computer Science Division](#), [School of Information Management and Systems](#)

## DIGITAL LIBRARIES INITIATIVE PHASE 2

### **D-Lib Magazine July/August 1999**

**Volume 5 Number 7/8**

**ISSN 1082-9873**

## **Digital Libraries Initiative - Phase 2**

### **Fiscal Year 1999 Awards**

Stephen M. Griffin  
National Science Foundation  
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---

The following list contains performer and abstract information for awards made in Fiscal Year 1999 as part of the Digital Libraries Initiative - Phase 2 (DLI-2). Spring 1999 actions are listed first, followed by earlier awards made in Fall 1998.

The Digital Libraries Initiative - Phase 2 consists of 3 major components: the Research, Testbeds and Applications component (<http://www.nsf.gov/cgi-bin/getpub?nsf9863>); an evolving Undergraduate Emphasis component (<http://www.nsf.gov/cgi-bin/getpub?nsf9863> plus updates at <http://www.dli2.nsf.gov/under.html>); and the International Digital Libraries Collaborative Research component (<http://www.dli2.nsf.gov/intl.html>).

There are no additional general calls for proposals planned at this time. Future competitions for special emphasis activities are anticipated as the Initiative progresses.

Review panels scheduled for this summer and early fall may result in additional actions in this fiscal year. However, awards from proposals received for the May 17 deadline will be determined in fiscal year 2000, which begins October 1, 1999.

More complete information on the program, funded projects, and related

## **D-Lib Magazine** **July/August 1999**

**Volume 5 Number 7/8**

**ISSN 1082-9873**

# **Perspectives on DLI-2 - Growing the Field**

Michael Lesk  
National Science Foundation  
[mlesk@nsf.gov](mailto:mlesk@nsf.gov)

Digital Libraries Initiative Phase 2 (DLI-2), compared with the first set of projects which began in 1994, is a larger and broader effort. It received around three times as many proposals (230 requesting over \$400M), and they went to a management group of more than twice as many government agencies. The 24 funded projects cover a substantially wider range of subjects and media, and the program involves about twice as much money in total as the DLI-1 round of projects five years ago. The increase in activity, sponsorship, and breadth reflects the success of the field and, in particular, the success of the DLI-1 projects and the public attention and interest they achieved with their results. We can only regret that funding limits prevent still larger and more ambitious projects.

Most important administratively is the expansion of the group of government agencies sponsoring the program. DLI-2 is an effort of the:

- National Science Foundation (NSF)
- Defense Advanced Research Projects Agency (DARPA)
- National Library of Medicine (NLM)
- Library of Congress (LOC)
- National Endowment for the Humanities (NEH)
- National Aeronautics & Space Administration (NASA)
- Federal Bureau of Investigation (FBI)

In partnership with the:

## **D-Lib Magazine June 1999**

**Volume 5 Number 6**

**ISSN 1082-9873**

# **The Joint NSF/JISC International Digital Libraries Initiative**

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JISC Head of Programmes

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Phone +44 115 951 4799, Fax +44 115 951 4791, Email: [head.programmes@jisc.ac.uk](mailto:head.programmes@jisc.ac.uk)

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Stephen M. Griffin

Division of Information and Intelligent Systems (IIS)

Program Director: Special Projects, Digital Libraries Initiative

National Science Foundation, 4201 Wilson Boulevard, Room 1115  
Arlington, VA 22230

Phone: (703) 306-1930, Fax: (703) 306-0599, Email: [sgriffin@nsf.gov](mailto:sgriffin@nsf.gov)

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## **Introduction**

Among the most exciting of opportunities offered by a global information infrastructure are international digital libraries -- content-rich, multimedia, multilingual collections created from globally distributed resources by international groups engaged in collaborative efforts. While there are now uncoordinated efforts in many countries, cooperative programs of research and intellectual infrastructure development can help avoid duplication of effort, prevent the development of fragmented digital systems, and



## *Abstracts of Awards for Special Projects -- IIS (FY 98)*

[Search the abstracts of awards for CISE](#)

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**Oregon Health Sciences University; Gorman, Paul; Tracking Footprints Through an Information Space: Leveraging the Document Selections of Expert Problem Solvers; [IIS-9817492](#); Estimate Total Award Amount: \$649997.**

The goal of this project is to help expert problem solvers find needed information in a large, complex information space. The focus is on one example of expert problem solving; the health care field. Sorting through such a heterogeneous collection of electronic and other media materials to find needed information, sometimes under time duress can be formidable. This project proposes to capture the trace of information used by experts - to monitor the paths taken and collection resources used by, in this case physicians, in moving from observation, to information gathering, to solution of a given health care problem. By capturing the artifactual trace information associated with information seeking and selection, it is hypothesized that greater insight can be gained into behaviors of users and patterns of usage. This knowledge can then be fed-back into the design and development of new information environments. The work will be conducted by a cross-disciplinary team comprised of an MD focusing on information seeking behaviors of physicians, and a group of computer scientists focussing on extracting and using regular structured information. The usefulness of the approaches will be tested in domains other than health care, in particular the aircraft design industry through the active support of the Boeing Corporation.

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**University of Michigan Ann Arbor; Atkins, Daniel; The University of Michigan Digital Libraries Research Proposal; [IIS-9411287](#); Estimate Total Award Amount: \$4357199.**

This project conducts research that will lead to the implementation and deployment of a digital library testbed and environment of textual, video, still image, and data sets, from both primary and secondary information suppliers. The project will make available capabilities and services to a large number of users at multiple locations. The basic approach is one of self-assembling agent based federation of distributed collections. The testbed is an extension of existing DIRECT and TULIP projects. The testbed content is primarily concerned with the earth and space sciences. The testbed will proceed in three releases, each incorporating additional information and making available more advanced capabilities. Usage and user evaluations will be reincorporated into the testbed to contribute to rational system evolution.

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## Online Document System

### Digital Libraries Initiative - Phase 2



[HTML document](#)



[ASCII Text](#)



[PDF](#)

**Document Date:** *February 20, 1998*

For more information about file formats used on the NSF site, please see <http://www.nsf.gov/home/pubinfo/plugins.htm>.

[nsf.gov](http://www.nsf.gov)

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#### The National Science Foundation

4201 Wilson Boulevard, Arlington, Virginia 22230, USA

Tel: 703-292-5111, FIRS: 800-877-8339 | TDD: 703-292-5090

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# PROGRAM ANNOUNCEMENTS

[DLI2 HOME](#)[DLI1 \(1994-1998\)](#)[SEARCH](#)

## Planning Testbeds and Applications for Undergraduate Education

To continue the exploration of digital library research efforts and testbeds for undergraduate education, NSF anticipates providing up to \$1 million for digital library projects submitted to the Special Emphasis: Planning Testbeds and Applications for Undergraduate Education within the Digital Libraries Initiative - Phase 2. The purpose of this addendum is to provide supplemental information to the Program Announcement [NSF 98-63](#) and the description of this Special Emphasis in that announcement.

Successful applicants are expected to demonstrate high potential to advance undergraduate science, mathematics, engineering, and technology (SMET) education. Areas of particular interest for DLI-2 proposals to NSF include:

- Planning grants for the construction, coordination, and maintenance of a national digital library for SMET education. Proposals should address organizational structure, business models, user needs, integrative functions that will work in education context, and interoperability among existing and projected distributed components of the library.
- Evaluation: Impact of digital libraries on teaching and learning, usability
- Quality assurance: Mechanisms for acquisition and selection and for peer review and annotation of curricular materials
- Collaboration: Digital learning environments, tools that support collaboration in teaching and learning with robust linkages among distributed collections
- Collection development: Collection development is distinct from content development. Other NSF programs – for example the Course, Curriculum, and Laboratory Improvement Program – provide support for content development. Collection development refers to the development of validated, substantial, and coherent collections of resources for SMET education.

**Related NSF Undergraduate Education Digital Library Program Announcement: "Element 2: Application of Digital Libraries to Undergraduate Earth Systems Science Education" in NSF program announcement [Geoscience Education NSF 99-44](#)**

### Recent Reports on Digital Library Applications for Undergraduate Education

- General background information on digital libraries may be found in the [Report of the SMETE Library Workshop](#) held at the National Science Foundation on July 21-23, 1998, to explore the idea of national digital library for undergraduate science, mathematics, engineering and technology education.



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## Online Document System

### International Digital Libraries Collaborative Research



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[PDF](#)

**Document Date:** *November 9, 1998*

For more information about file formats used on the NSF site, please see <http://www.nsf.gov/home/pubinfo/plugins.htm>.

[nsf.gov](http://www.nsf.gov)

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**University of California at Berkeley**

Environmental Planning and  
Geographic Information Systems

**University of California at Santa Barbara**

The Alexandria Project:  
Spatially-referenced Map  
Information

**Carnegie Mellon University**

Informedia Digital Video Library

**University of Illinois at Urbana-Champaign**

Federating Repositories of Scientific  
Literature

**University of Michigan**

Intelligent Agents for Information  
Location

**Stanford University**

Interoperation Mechanisms Among  
Heterogeneous Services

DLI Project **Contacts**

**DLI Workshop Series**

The Initiative's focus is to dramatically advance the means to collect, store, and organize information in digital forms, and make it available for searching, retrieval, and processing via communication networks -- all in user-friendly ways.

Digital Libraries basically store materials in electronic format and manipulate large collections of those materials effectively. Research into digital libraries is research into network information systems, concentrating on how to develop the necessary infrastructure to effectively mass-manipulate the information on the Net.. The key technological issues are how to search and display desired selections from and across large collections. Summaries of the six DLI projects from the May 1996, **Special Issue on Digital Libraries** in the Institute of Electrical and Electronics Engineers, IEEE Computer Magazine.

The magazine of digital library research, the **D-Lib Magazine**, including the July/August 1996 issue **The DLI Testbeds: Today and Tomorrow.**

Digital Library conference information, publications, related projects and resources to the DLI, **Digital Library Related Information and Resources.**

**NSF Digital Libraries Contact**

National Synchronization for the Digital Library Initiative is being coordinated by the University of Illinois at Urbana-



Site for publications from all six Digital Libraries Initiative projects.

- **UNIVERSITY OF CALIFORNIA  
at Berkeley**
- **UNIVERSITY OF CALIFORNIA  
at Santa Barbara**
- **CARNEGIE MELLON UNIVERSITY**
- **UNIVERSITY OF ILLINOIS  
at Urbana-Champaign**
- **UNIVERSITY OF MICHIGAN**
- **STANFORD UNIVERSITY**

Comments to [Tom Habing](#)

Last updated 5/26/98

# DLI - Carnegie Mellon:

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- [Home page - Informedia](#)
- [Informedia-II \(for DLI-2\)](#)
- [IEEE Computer article](#)
- [NetBill](#)

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Please send comments/suggestions to [Ed Fox](#).

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# Welcome to the *informedia project* digital video library

digital video library  
research  
@ Carnegie Mellon

**QUICK LINKS:** [Informedia-II](#) [Informedia-I](#) [ARDA VACE](#) [NSF NSDL](#) [ECHO](#) [East-West DL](#) [EOD](#)

## About Us

The Informedia Digital Video Library project is a research initiative at Carnegie Mellon University funded by the NSF, DARPA, NASA and others that studies how multimedia digital libraries can be established and used. The Informedia project has pioneered new approaches for automated video and audio indexing, navigation, visualization, search and retrieval and embedded them in a system for use in education, information and entertainment environments. Intelligent, automatic mechanisms are being developed to populate the library. Research in the areas of speech recognition, image understanding, and natural language processing supports the automatic preparation of diverse media for full-content and knowledge based search and retrieval.

## Current Projects

### Informedia-II

Sponsored by the National Science Foundation Digital Library Initiative Phase II.

### Video Information

#### Summarization and

#### Demonstration Testbed

Sponsored by [ARDA](#) (Advanced Research and Development Activity) under the Video Analysis and Content Exploitation (VACE) program.

### Threading Information

#### Pathways Through NSDL Video

Sponsored by the [NSF's National SMETE Digital Library \(NSDL\)](#) Program.

### European Chronicles On-Line

**(ECHO)** - The [European Chronicles On-line](#) (ECHO)

project is a joint effort of European content partners, U.S. and European academic and government research partners, and industrial development partners headquartered on both

## Past Projects

### Informedia-1

One of the original NSF-funded Digital Library Initiative (DLI) projects, uniquely combining speech recognition, image understanding and natural language processing technology to automatically transcribe, segment and index linear video.

### Experience-on-Demand

A DARPA-sponsored effort that developed tools, techniques, and systems that allow users to capture complete records of personal experience and to share them in collaborative settings.

### Multilingual Informedia

The Multilingual Informedia project developed automated systems and tools to enable multilingual and multimedia information capture, search, retrieval, summarization, and reuse.

## What's New!

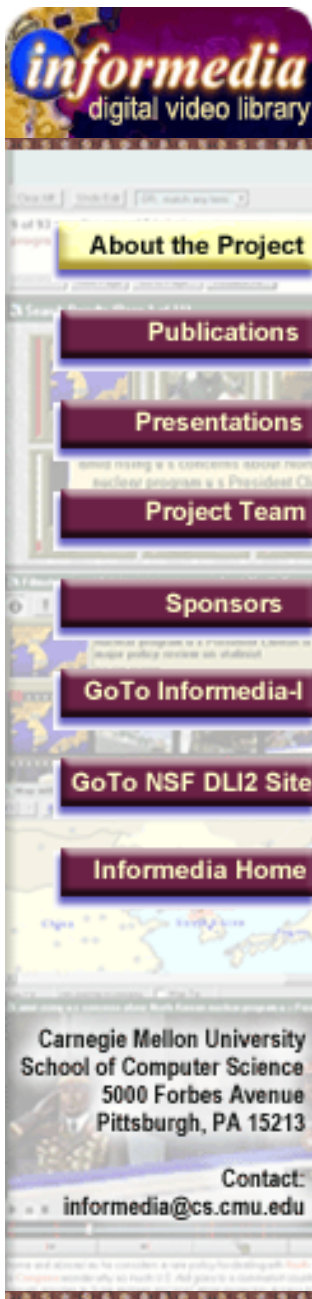
**Informedia recently appeared in MIT Technology Review...**

[Upstream: Video Searching](#) By David Voss (July/August 2001)

[TheTechnology Review Ten: Data Mining](#), by M. Mitchell Waldrop (January/February 2001)

## Contact

Informedia Digital Video Library  
Carnegie Mellon University  
School of Computer Science  
5000 Forbes Avenue  
Pittsburgh, PA 15213  
[informedia@cs.cmu.edu](mailto:informedia@cs.cmu.edu)



## Informedia-II: Auto Summarization and Visualization Across Multiple Video Documents and Libraries

Sponsored by:  
National Science Foundation

# Welcome to the CMU Informedia-II Website

## Project Description

### Introduction

Vast collections of video and audio recordings which have captured events of the last century remain a largely untapped resource of historical and scientific value. The Informedia Digital Video Library project at Carnegie Mellon University has pioneered new approaches for automated video and audio indexing, navigation, visualization, search and retrieval and embedded them in a system for use in education, information and entertainment environments. This project was initiated in 1994 as one of six Digital Library Initiative (DLI) projects funded jointly by NSF, DARPA and NASA, and is the only one focused on the video medium. We continue the fundamental goal of enabling for video all the functionality and capability existing for textual information retrieval, while leveraging its temporal and visual qualities for richer information delivery. Informedia-II establishes an era focused for the user as we introduce new paradigms for video information access and understanding. We aggregate and integrate video content on-demand to enable summarization and visualization that provides responses to queries in a useful broader context, perhaps with historic or geographic perspectives.

### Background

The Informedia system provides *full-content* search and retrieval of current and past TV and radio news and documentary broadcasts. The system implements a fully automated process to enable daily content capture, information extraction and storage in on-line archives by applying artificial intelligence and advanced systems technology. The current library consists of a 1,500 hour, one terabyte library of daily news captured over the last two years and documentaries produced for public television and government agencies. This prototype database allows for rapid retrieval of individual *video paragraphs* which satisfy an arbitrary spoken or typed subject area query based on the words in the soundtrack, closed-captioning or text overlaid on the screen. There is also a capability for matching of similar faces and images.

Our approach uniquely combines speech recognition, image understanding and natural language processing technology to automatically transcribe, segment and index the linear video. These same tools are applied to accomplish intelligent video search, navigation and selective retrieval. The process automatically generates various summaries for each story segment: headlines, filmstrip story-boards and video-skims. Figure 1 illustrates a typical query and result set display.

From *Computer* theme issue on the US Digital Library Initiative, May 1996

*Information retrieval is an increasingly complex process, due to digital integration of video, audio, and text resources. An experimental project will explore the challenges posed by these digital video libraries.*

# Intelligent Access to Digital Video: Informedia Project

Howard D. Wactlar, Takeo Kanade, Michael A. Smith, and Scott M. Stevens,  
*Carnegie Mellon University*

Informedia Digital Video Library project[\[1\]](#) will establish a large, online digital video library featuring full-content and knowledge-based search and retrieval. Intelligent, automatic mechanisms will be developed to populate the library. Search and retrieval from digital video, audio, and text libraries will take place via desktop computer over local, metropolitan, and wide area networks. Initially, the library will be populated with 1,000 hours of raw and edited documentary and education videos drawn from video assets of WQED/Pittsburgh, Fairfax County (Virginia) Public Schools, and the Open University (United Kingdom). To assess the value of video reference libraries for enhanced learning at different ages, we will deploy the library at Carnegie Mellon University and local schools, from elementary school through high school.

Our approach applies several techniques for content-based searching and video-sequence retrieval. Content is conveyed in both the narrative (speech and language) and the image. Only by the collaborative interaction of image, speech, and natural language understanding technology can we successfully populate, segment, index, and search diverse video collections with satisfactory recall and precision.

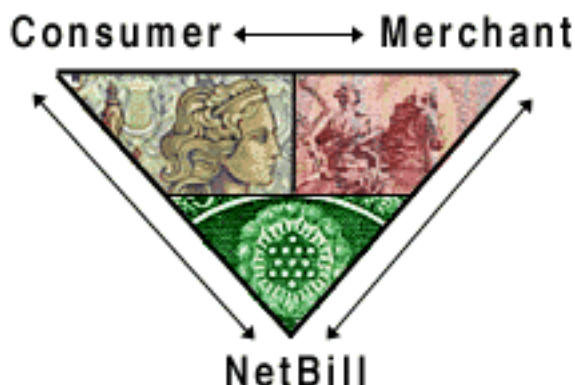
This collaborative interaction approach uniquely compensates for problems of interpretation and search in error-ridden and ambiguous data sets. We start with a highly accurate, speaker-independent, connected speech recognizer that automatically transcribes video soundtracks. A language-understanding system then analyzes and organizes the transcript and stores it in a full-text information retrieval system. This text database permits rapid retrieval of



# The NetBill Project

- ◆ Overview
- ◆ News
- ◆ Publications
- ◆ Technical Partners
- ◆ Project Members
- ◆ Commerce Resources

*A dependable, secure, and economical payment method for purchasing digital goods and services through the Internet.*



The NetBill electronic commerce project at Carnegie Mellon's [Information Networking Institute](#) is researching design issues of highly survivable and secure distributed transaction processing systems, as well as accounting and access control for digital libraries. NetBill is addressing these issues by developing the protocols and software to support network-based payment for goods and services over the Internet.

These protocols and software have been implemented in a test system, currently in its Alpha trial, on the Carnegie Mellon campus. This system enables consumers and merchants to communicate directly with each other, using NetBill to confirm and ensure security for all transactions.

We invite you to take a look at this test system at:

<http://www.netbill.com>

NetBill is publicly available to United States residents. For those not in the US, there is plenty of information about NetBill for you to explore.

For more information about the NetBill project, please explore this web site using the links on the left of each page.

# DLI - Stanford:

---

- [Home Page](#)
- [IEEE Computer article](#)
- [testbed development](#)
- [info finding](#)
- [user interfaces](#)
- [DLITE \(task env\)](#)
- [SDLIP](#) (Simple DL Interop. Protocol) - also see [D-Lib Magazine article](#)
- [mediation infrastructure](#)

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Please send comments/suggestions to [Ed Fox](#).

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# STANFORD DIGITAL LIBRARY TECHNOLOGIES

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[Theory Group](#)

[Stanford Libraries](#)

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[SDLIP](#)

[InterBib](#)

[PalmPilot Infrastructure](#)

### RESOURCES

The Stanford Digital Library Technologies Project was initiated in July as part of the Federally funded Digital Library Initiative Phase 2. The goal of this Project is to design and implement the infrastructure and services needed for collaboratively creating, disseminating, sharing and managing information in a digital library context.

The Stanford Digital Library Technologies Project is one participant in the [DLI2](#), Digital Library Initiative Phase II, started in 1999 and supported by the

National Science Foundation [NSF Digital Libraries Initiative](#)

Defense Advanced Research Projects Agency [DARPA Information Technology Office](#)

National Library of Medicine [NLM Extramural Programs](#)

Library of Congress [LOC Digital Library Initiatives](#)

National Endowment for the Humanities [NEH Digital Library Initiative](#)

National Aeronautics and Space Administration [NASA](#)

Federal Bureau of Investigation [FBI](#)

The Stanford Digital Library Technologies Project was funded from three coordinated proposals, from The University of California at Berkeley [UCB](#), the University of California at Santa Barbara [UCSB](#), and Stanford University. One of our major goals is to demonstrate our technologies on the emerging California Digital Library, [CDL](#) and to implement and evaluate these technologies on a testbed system to be built with the help of the San Diego Supercomputer Center, [SDSC](#). All three projects together yield a synergistic and comprehensive digital libraries project.

The Stanford component of this effort will develop the base technologies that are required to overcome the most critical barriers to effective digital libraries. One of these barriers is the heterogeneity of information and services. Another impediment is the lack of powerful filtering mechanisms that let users find truly valuable information. The continuous access to information is restricted by the unavailability of library interfaces and tools that effectively operate on portable devices. A fourth barrier is the lack of a solid economic infrastructure that encourages providers to make information available, and give users privacy guarantees. See the [summary](#) for more information.

In November 1998, we spent some time to look back at our efforts of our DLI1 research. These ruminations led to a [publication](#) and a [presentation](#). Both are entitled: "Building the InfoBus. A Review of Technical Choices in the Stanford Digital Library". We talk about infrastructure decisions, about why USMARC in the end wasn't quite right for us, and about how deeply user traditions impacted the details of our technical designs.

Our collection in DLI1 was primarily computing literature. However, we also had a strong focus on networked information sources, meaning that the vast array of topics found on the World Wide Web are accessible through our project as well. At the heart of the DLI1 project is the [testbed](#) running [the "InfoBus" protocol](#), which provides a uniform way to access a variety of services and information sources through "proxies" acting as interpreters

From *Computer* theme issue on the US Digital Library Initiative, May 1996

# Using Distributed Objects for Digital Library Interoperability

Andreas Paepcke, Steve B. Cousins, Hector Garcia-Molina, Scott W. Hassan, Steven P. Ketchpel, Martin Röscheisen, and Terry Winograd, *Stanford University*

*Distributed object technology can provide interoperability among emerging digital library services. This project uses CORBA objects as wrappers to handle differences in service interaction models.*

Information repositories are just one of many services tomorrow's digital libraries might offer. Other services include automated news summarization, trend analysis across news repositories, and copyright-related facilities. Traditional library services such as archiving and collection building will continue to be relevant as well. Archiving issues in the digital world include, for example, dangling hyperlinks and storage media obsolescence.

This distributed collection of services has the potential to be enormously helpful in performing information-intensive tasks. It could also turn such tasks into confusing, frustrating annoyances by forcing programmers and users to learn many interfaces and by confronting users with the bewildering details of fee-based services that were previously only accessible to professional librarians.

The Stanford Digital Library project has undertaken work to address the problem of interoperability, which is particularly important because standardization efforts are lagging behind the development of digital library services. We used CORBA,[\[1\]](#) the distributed-object standard developed by the Object Management Group, to implement information-access and payment protocols. These protocols are designed to provide the interface uniformity necessary for interoperability, while leaving implementers a large amount of leeway to optimize performance and to provide choices in service performance profiles.

We have implemented an experimental version of our information-access



# STANFORD DIGITAL LIBRARY TECHNOLOGIES

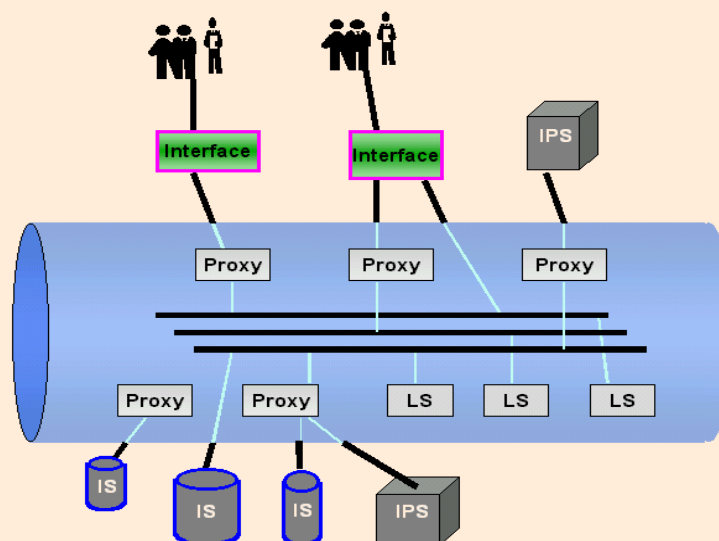
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[DOCUMENTS](#)
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[RESOURCES](#)

## Testbed Highlights

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[TESTBED](#)
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[SDLIP: The Movie](#)
[InterBib](#)
[PalmPilot Infrastructure](#)

## The Stanford Digital Library Testbed

The Stanford Digital Library testbed is our platform for experimentation with interoperation among online services. Our basic approach is to use **distributed objects** to allow integrated access to heterogenous services across networks. We call this system the InfoBus. The distributed approach allows the interaction of processes on different machines, with different architectures, implemented in different languages. We use **CORBA** to provide communication between remote processes. In particular, we use Xerox PARC's **ILU**, a free implementation of a CORBA superset, **MICO**, a free CORBA implementation under the Gnu license, and **Visigenic**, a commercial provider. We use Java, C++, and the interpreted, object-oriented language Python for our development work. Our computing platforms include Sun, PC-based architectures, and 3COM Palm Pilots.



LS: Library Service  
IS: Information Source  
IPS: Information Processing Service

For more information on the underlying technologies, see:

### CORBA

- Information from the [OMG](#), including a [Beginners' page](#)

### ILU

- [Xerox PARC's ILU Home Page](#)

### MICO

- [MICO's Home Page](#)

### Visibroker

- [Visibroker Home Page](#)



# Information Finding Projects in the Stanford Digital Library

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One of the major research thrusts of the Stanford Digital Library project is helping users to find information. We have initiated a number of projects in this area, most related to our over-arching theme of interoperability. We have looked at ways that search tools can be used across multiple sources that use different syntaxes or languages. We have also looked at tools to provide statistical or collaborative filtering to locate relevant articles.

---

## FAB

FAB is an adaptive multi-agent information retrieval system which finds interesting pages on the web.

"[An Adaptive Agent for Automated Web Browsing](#)"

- [Marko Balabanovic](#)

---

## GLOSS

The Glossary Server of Servers (GLOSS) project is designed to locate relevant information sources for your query.

"[Generalizing GLOSS to Vector-Space Databases and Broker Hierarchies](#)"

- [Luis Gravano](#)

---

## [Query Translator](#)

Databases have different query syntax and different capabilities, even for simple Boolean queries. Translation allows a single query to be mapped into the native format appropriate for each database.

- [Chen-Chuan K. Chang](#)



# User Interface Projects in the Stanford Digital Library

Too often the power of a search engine goes untested because users don't know how to exploit the advanced (or even basic) features. The use of a browser front-end has eased platform independent rapid prototyping, allowing a wide variety of services such as information clustering, annotating, and re-distributing via the WWW. One project even uses a web application to help create web applications! But the web does have drawbacks, such as being largely inaccessible to blind users (hear our audio interface!) and limiting the types of possible interaction. Therefore, our DLITE interface uses a direct manipulation metaphor of iconic representations, rather than relying on CGI forms.

---

## SenseMaker

SenseMaker helps users iteratively reformulate their information needs through multi-dimensional organizing and active gathering of search results.

"SenseMaker: An Information-Exploration Interface Supporting the Contextual Evolution of a User's Interests"

- Michelle Q Wang Baldonado

---

## DLITE: A Digital Library Interface

A direct manipulation user interface designed to support user tasks, to smoothly integrate the results of many services, to handle services of widely-varying time scales, to be extensible, and to support sharing and reuse.

"The Digital Library Integrated Task Environment (DLITE)"

- Steve Cousins

---

## Grassroots

Groupware for information finding, combines mail, news, and web in a single environment with



# Stanford Digital Library

## Technologies



## SIDL-WP-1996-0049

### The Digital Library Integrated Task Environment (DLITE)

Steve B. Cousins, Andreas Paepcke, Terry Winograd, Eric A. Bier, Ken Pier

[\*cousins@cs.stanford.edu\*](mailto:cousins@cs.stanford.edu)

**Abstract:** We describe a case study in the design of a user interface to a digital library. Our design stems from a vision of a library as a channel to the vast array of digital information and document services that are becoming available. Based on published studies of library use and on scenarios, we developed a metaphor called workcenters, which are customized for users' tasks. Due to our scenarios and to prior work in the CHI community, we chose a direct-manipulation realization of the metaphor. Our system, called DLITE, is designed to make it easy for users to interact with many different services while focusing on a task. Users have reacted favorably to the interface design in pilot testing, but a problem surfaced: we need a mechanism to teach new users about the metaphor and interface. We conclude by describing our approaches to this problem.

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**Note:** Papers in this series are in development and are not in a final form for publication or general dissemination. They are subject to change. Please do not quote or further distribute them without explicit permission from the authors.

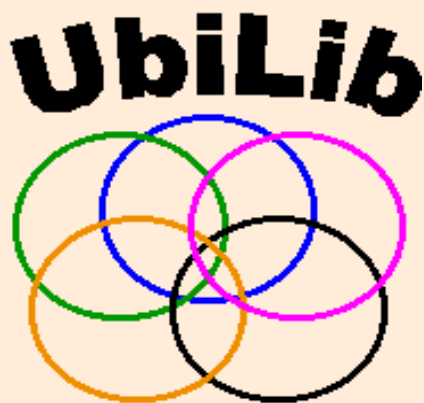
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This paper was created on: 9/20/96 and last revised on: 1/14/1997

**Author's Comments:** Submitted to DL'97

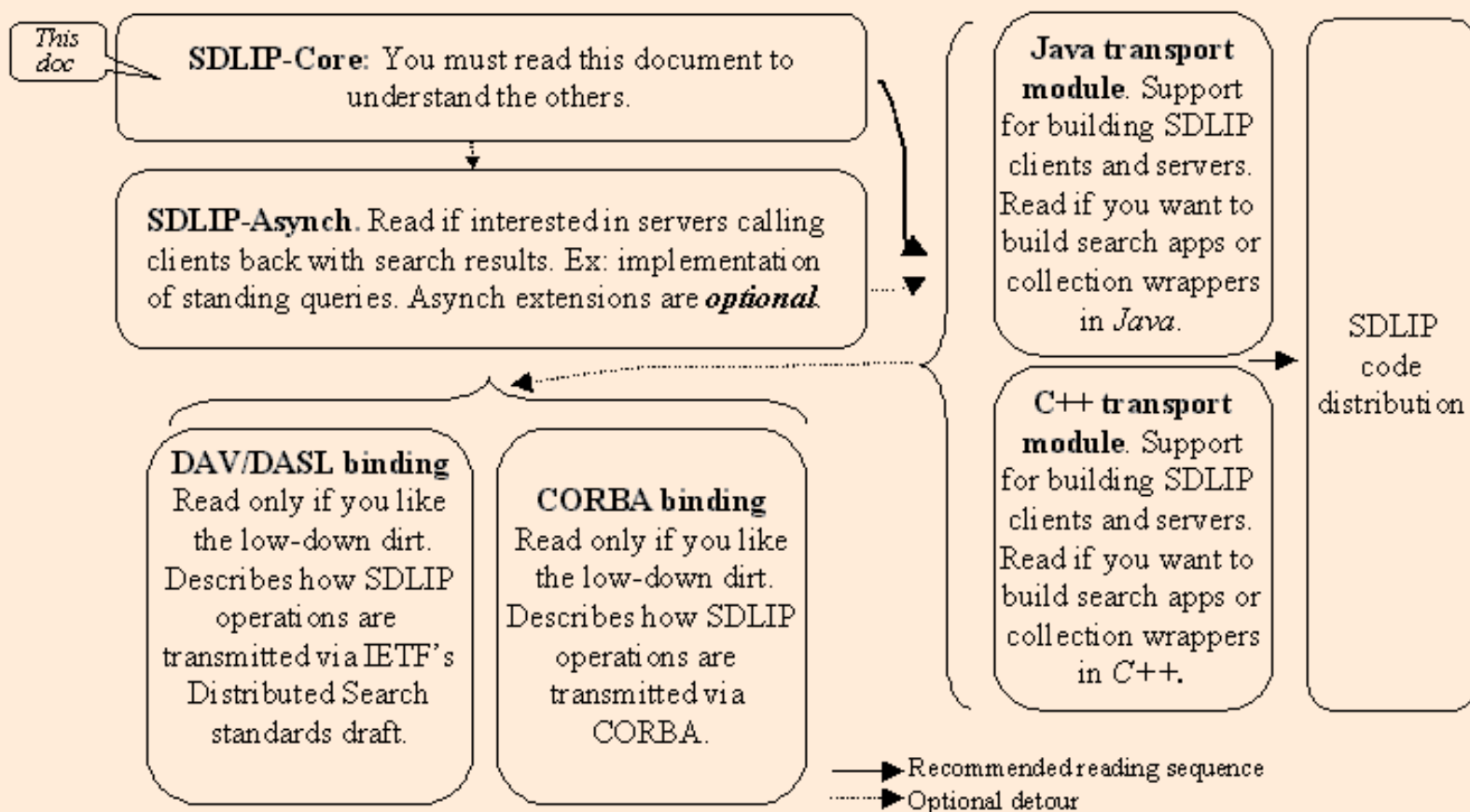
**Status:** PUBLIC

[Click here to see the full text of SIDL-WP-1996-0049](#) (PS)



# The Simple Digital Library Interoperability Protocol (SDLIP-Core)

SDLIP document map and recommended reading sequence (click to navigate):



## Contents:

### [1. Introduction and Overview](#)

#### [1.1 Grouping of Operations Into Interfaces](#)

#### [1.2 Different Ways of Using SDLIP](#)

#### [1.3 When Can Servers Discard State?](#)

#### [1.4 Implementation Architecture](#)

## **D-Lib Magazine March 2000**

**Volume 6 Number 3**

**ISSN 1082-9873**

# **Search Middleware and the Simple Digital Library Interoperability Protocol**

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[rsram@cs.stanford.edu](mailto:rsram@cs.stanford.edu)



# Stanford Digital Library

## Technologies



### SIDL-WP-1999-0126

#### **A Mediation Infrastructure for Digital Library Services**

Sergey Melnik, Hector Garcia-Molina, Andreas Paepcke

[melnik@db.stanford.edu](mailto:melnik@db.stanford.edu)

**Abstract:** Digital library mediators allow interoperation between diverse information services. In this paper we describe a flexible and dynamic mediator infrastructure that allows mediators to be composed from a set of modules ("blades"). Each module implements a particular mediation function, such as protocol translation, query translation, or result merging. All the information used by the mediator, including the mediator logic itself, is represented by an RDF graph. We illustrate our approach using a mediation scenario involving a Dienst and a Z39.50 server, and we discuss the potential advantages and weaknesses of our framework.

---

**Note:** Papers in this series are in development and are not in a final form for publication or general dissemination. They are subject to change. Please do not quote or further distribute them without explicit permission from the authors.

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This paper was created on: 12/01/99 and last revised on:12/1/1999

**Author's Comments:** Submitted to ACM Digital Libraries 2000

**Status:** PUBLIC

[Click here to see the full text of SIDL-WP-1999-0126](#) (PDF)

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- [Home Page](#)
  - [IEEE Computer article](#)
  - [Tours](#)
  - [Collections](#)
  - [Source Code](#)
  - [Document-specific image decoders](#)
  - [GISviewer](#) (needs latest browser)
  - [Photos](#) and demos
    - [Context-based image queries](#)
    - [Blobworld](#)
    - [Image classification](#)
  - [UCB database management](#)  
and the Open Source Berkeley DB: [Sleepycat Software](#)
  - [California Aerial Photos](#)
  - [United States Department of Agriculture PLANTS Photo Gallery](#)
- 

## Pedagogy:

We recommend that the reader study these materials as part of work to answer the following questions:

- MVD
  - How well does [MVD 0.9](#) work for you? Could you get the links on that page to work (use 2 windows of browser, one for the instructions, and one for testing)? What do you like most about it?
  - Did you use it on video or a PC or Mac with Netscape 4?
  - Did you work out Lens overlaying, such as OCR and then Magnify?
  - For the TableSort example, could you under Anno view the note?
  - Could you get the special behaviors to work: Biblio, where you Select a type of format, use the mouse to select an entry, use Edit and Copy to get a version in that format, and then paste elsewhere?
  - Could you get Doublespace in the View menu to work?
- Cheshire
  - Can you find interesting environmental documents using Cheshire II?
- TileBars

- What happens with TileBar search of "document" and "retrieval"?
- What happens with TileBar search of "fault" and "dam"?
- When is TileBar searching useful on a single document?
- Collections
  - What is the name of the DBMS used?
  - What is a database "schema"? How does it relate to "metadata"?
  - How many documents and how many images are in their collection?
  - How good is the OCRing? What research is underway to improve OCRing beyond that of ScanWorX and how well does it work? What is the main idea behind it?
  - How can you find the dams for a county?
  - How does the database table information for Almond dam relate to the page about it? To the OCR output about that page?
  - What is a VLURL? How do you construct it? Can you build one and show results for getting pictures of California wildflowers that have the string "rose" in their common names?
  - Display a distribution map for your favorite flower in California.
  - Can you tell the direction of flight from the aerial photos?
  - How do layers help with managing GIS information with the [GIS viewer](#)? Can you zoom in and out and pan around?

---

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---

Please send comments/suggestions to [Ed Fox](#).

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## Re-inventing Scholarly Information Dissemination and Use

The UC Berkeley Digital Library Project is developing the tools and technologies to support highly improved models of the "scholarly information life cycle." Our goal is to facilitate the move from the current centralized, discrete publishing model, to a distributed, continuous, and self-publishing model, while still preserving the best aspects of the current model such as peer review.

[Search](#)

[Seminar](#)

[Calendar](#)

[What's New](#)

[Questions](#)

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♦ [New Document Models](#)

including [Web-based GIS](#)  
and [TilePic](#)

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♦ [Robust References](#)

♦ [Distributed Search](#)

♦ [NLP for Information Access](#)

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[Collections](#)

♦ [Overview of the Collections](#)

♦ [Usage and Copyright](#)

[Information](#)

### About the Project

♦ [People](#), [Publications](#), [Systems](#),  
and [more](#)

♦ [Info for Project Members](#)

♦ [Related Projects](#)

The UC Berkeley Digital Library Project is part of the [Digital Libraries Initiative](#), sponsored by the National Science Foundation and many others. Additional funding at Berkeley comes from the [CNRI-sponsored D-Lib Test Suite](#), and the NSF-sponsored [National Partnership for Advanced Computational Infrastructure \(NPACI\)](#).

This page is dedicated to the memory of [Gary Kopec](#).

This server is powered by a [SUN Microsystems](#) Enterprise 450 Server, backed by an [IBM](#) 7013 RS 6000 and 3494 Tape Library Dataserver running AMASS software by [EMASS](#). See [About Our System](#) for details.

From *Computer* theme issue on the US Digital Library Initiative, May 1996

*Information retrieval becomes an increasing challenge as comprehensive image databases emerge alongside traditional text databases. Here, a set of digital information services offers intriguing new retrieval possibilities.*

# **Toward Work-Centered Digital Information Services**

Robert Wilensky, *University of California, Berkeley*

Work-centered digital information services are library services that address a work group's information retrieval needs. These services differ in several ways from those required of digital libraries or information systems that meet, for example, education- or entertainment-related needs.

First, work groups frequently want to retrieve information, rather than documents per se. Because the answer to a query may be in more than one document, or even in textual form, users require information systems that can perform powerful, complex retrieval and analysis of heterogeneous objects.

Second, a work group must be able to access its own collections of varying data types, including legacy documents, in addition to external data collections. Work groups also continually create new materials, which are subject to differing degrees of external access. This requires flexible authoring, structuring, and delivery mechanisms.

Third, users must be able to integrate an information system into their established work practices, even as the system augments those practices. System interoperability is thus essential and may require custom interfaces. Information system evaluation must consider the system's contribution to the work group's goals, its support of existing work group practices, and its contribution to work practice innovations.

Realizing work-centered digital information systems requires a broad technical agenda that includes



# Digital Library Tours

*Berkeley Digital Library Project*

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## Guided Tours:

 [Documents](#)

 [Images](#)

 [GIS Viewer](#)

*(tours require frames support)*

---



[Berkeley DL](#)



[AccessMatrix](#)



[Information](#)



[Comments](#)

---

# Quick Access to the Collections

See also: [Disclaimer](#) | [Usage](#) | [Botanical Data](#) | [Geographical Data](#) | [Zoological Data](#)

	Description	More Information
Photographs	<ul style="list-style-type: none"> <li>CalPhotos: <a href="#">All</a>, <a href="#">Plants</a>, <a href="#">Fungi</a>, <a href="#">Animals</a>, <a href="#">People</a>, <a href="#">Landscapes</a>, <a href="#">Africa</a>, <a href="#">Customized Query</a></li> </ul>	<ul style="list-style-type: none"> <li><a href="#">About the Image Collection</a></li> <li><a href="#">Using the Images</a></li> <li><a href="#">References</a></li> <li><a href="#">Blobworld</a></li> <li><a href="#">computer vision research</a></li> <li><a href="#">FAQ</a></li> </ul>
	<ul style="list-style-type: none"> <li><a href="#">Cal. Water Resources (DWR)</a></li> </ul>	
	<ul style="list-style-type: none"> <li><a href="#">Corel Stock Photos</a>, <a href="#">BlobWorld query</a></li> </ul>	
	<ul style="list-style-type: none"> <li><a href="#">Aerial Photos</a> Sacramento River Delta region, <a href="#">active map*</a>.</li> </ul>	
	<ul style="list-style-type: none"> <li><a href="#">Photographers</a> who contributed photos</li> </ul>	
	<ul style="list-style-type: none"> <li><a href="#">All the Photos</a> in the Berkeley DLP collection</li> </ul>	
Databases	<ul style="list-style-type: none"> <li><a href="#">Bay Area Streets with an index*</a>, or <a href="#">without an index*</a> (both use an active map)</li> </ul>	
	<ul style="list-style-type: none"> <li><a href="#">California dams</a>, <a href="#">static map</a>, <a href="#">active map*</a></li> </ul>	<ul style="list-style-type: none"> <li><a href="#">about the dams</a></li> </ul>
	<ul style="list-style-type: none"> <li><a href="#">CalFlora</a>: <a href="#">species</a>, <a href="#">observations</a>, <a href="#">synonymy</a></li> </ul>	<ul style="list-style-type: none"> <li><a href="#">about Calflora</a>, <a href="#">FAQ</a></li> </ul>
	<ul style="list-style-type: none"> <li><a href="#">Museum of Vertebrate Zoology</a> specimen records</li> </ul>	

	<ul style="list-style-type: none"> <li>• <a href="#">AmphibiaWeb</a></li> </ul>	<a href="#">About AmphibiaWeb</a>
	<ul style="list-style-type: none"> <li>• <a href="#">California Gazetteer: active map*</a></li> </ul>	
	<ul style="list-style-type: none"> <li>• Standard Names: <a href="#">continents</a>, <a href="#">countries</a>, <a href="#">US states</a>, <a href="#">Cal. counties</a></li> </ul>	
<b>Documents</b>	<ul style="list-style-type: none"> <li>• <a href="#">California Environmental</a> reports, plans, ordinances, EIRs, etc., <a href="#">browse lists</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">about the collection</a></li> <li>• <a href="#">document image analysis</a></li> <li>• <a href="#">new document models</a> <ul style="list-style-type: none"> <li>• <a href="#">about TileBars</a></li> </ul> </li> </ul>
	<ul style="list-style-type: none"> <li>• <a href="#">World Conservation Union (IUCN)</a> Action Plans</li> </ul>	
	<ul style="list-style-type: none"> <li>• <a href="#">Hamilton's 'Fishes of the Ganges' and Jepson's 'A Flora of California'</a></li> </ul>	
<b>Geographical Layers</b>	<ul style="list-style-type: none"> <li>• <a href="#">GIS Viewer Example List *</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">user manual</a></li> <li>• <a href="#">downloading</a> <ul style="list-style-type: none"> <li>• <a href="#">tour</a></li> </ul> </li> </ul>
	<ul style="list-style-type: none"> <li>• Street finder for the S.F. Bay Area: <a href="#">with</a> and <a href="#">without</a> street index (both active map*)</li> </ul>	
	<ul style="list-style-type: none"> <li>• <a href="#">California Gazetteer active map*</a></li> </ul>	
	<ul style="list-style-type: none"> <li>• <a href="#">Delta Fish Flow</a> active map *</li> </ul>	

\* java is required for active maps

[Overview of the Collections](#)  
 [About the Database](#)  
 [About the Digital Library Project](#)  
[Data Statistics](#)  
[Disclaimer & Usage](#)

# Source Code

This page links to source code developed at UC Berkeley for the Digital Library Project and other related projects. Before downloading source code, please read [Using DLP Data and Software](#) for copyright and licensing information. Unless otherwise specified below by individual copyright and usage information, source code on this page is covered by our [Copyright Notice](#).

If you find our code useful, and include some of it in your system, or base some research results on it, we would appreciate an acknowledgement and a reference. Please contact us at [www@elib.cs.berkeley.edu](mailto:www@elib.cs.berkeley.edu)

---

## Current System

**[Blobworld](#)** - content-based image retrieval system

**Cheshire II** - search engine and text retrieval system

- [copyright information](#)
- [download source code](#)

**GIS Viewer** - Java-based viewer for GIS data

- [ftp](#) (15 MB)
- [Help Using](#) and [Examples](#)
- [About downloading and using the GIS Viewer with your own data.](#)

**[CalPhotos image retrieval system](#)**

- WWW-SQL interface scripts for CGI and DBI; image processing scripts

**Miscellaneous Scripts**

- [mailconvert.p](#) - convert mh mail folders to Netscape
-

## Previous Work

**Chabot/Cypress** Image retrieval system (1995)

- Horizon finder: [horizon.c](#), [ppmtomit.c](#), [Makefile](#)
- Course-grained color analysis: [meets.c](#)

**[TextTiles](#)** - Multi-Paragraph Segmentation of Expository Texts (1993)

**[TileBars](#)** - A new visualization technique for full-text search results, implemented in Java (1997)

**[SATZ](#)** - An Adaptive Sentence Boundary Detector (1994)

**GIPSY** Geographically locates place names (1995)

- [README](#)
- [gipsy.tar](#)



[Digital Library Project](#)

University of California, Berkeley

questions & comments: [www@elib.cs.berkeley.edu](mailto:www@elib.cs.berkeley.edu)



# Advanced Structured Document Examples

## *Berkeley Digital Library Project*

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Below are links to examples of advanced structured documents created using document-specific image decoders. Each of the examples consists of a collection of interlinked pages that provide three representations of the scanned document. The first representation is a sequence of simple scanned page images, with the usual "Previous" and "Next" type links to adjacent pages. This representation is similar to the "page image" form offered by our document server. The second representation is the corresponding sequence of ascii text pages generated by a commercial omni-font OCR program, XIS ScanWorX. This representation is similar to the "hyperocr" form offered by our document server. The third representation is an advanced structured document created using document-specific image decoders, following the document image decoding (DID) approach described in Kopec and Chou, "Document Image Decoding Using Markov Source Models", *IEEE Trans. Pattern Analysis and Machine Intelligence*, vol. 16, no. 6, June, 1994.



Document-specific decoding is an active research area in the Berkeley Digital Library Project.

Comments and suggestions for additional documents to process are welcome at

[www@elib.cs.berkeley.edu](mailto:www@elib.cs.berkeley.edu)

---

- [DWR Bulletin 17, Dams Within Jurisdiction of the State of California](#)
  - [DWR Bulletin 155, General Comparison of Water District Acts](#)
  - [IESP Technical Report 9, Fishes of the Sacramento-San Joaquin Estuary...](#)
- 

## More Information about Document-Specific Decoding

The text content for each advanced structured document was obtained using a DID recognizer whose bitmap templates were generated from sample pages of the scanned document. A recently-developed template training system was used that generates templates from a set of page images plus errorful, whole-page transcriptions that are not aligned with images. The significance of this training system is that it allows document-specific character models to be developed with relatively little user effort. It is widely known that document-specific models can provide an order of magnitude improvement in OCR error rate, compared with typical omni-font OCR devices. However, training an OCR system for a particular font typically involves considerable manual effort. As a result, specialized recognition systems have only been cost-effective for relatively large homogeneous document collections.

The operating scenario supported by the training system is that a user prepares a transcription of a small

# Guided Tour of the UC Berkeley Digital Library Project GIS Viewer

## Welcome to the UC Berkeley Digital Library Project!

*GIS (Geographic Information System) Viewer* is a tool is being developed to support the use of maps and their underlying information. The GIS Viewer is implemented as a Java applet, which should be loading into the frame on the right as you read this text.

The GIS Viewer allows you to

- select and view multiple, possibly overlaid, [layers of geographic data](#)
- [pan](#) and [zoom](#) to select a region and level of resolution
- [query](#) data bases pertaining to on the presented layers
- [use annotations](#), as well as [create](#) your own annotations
- [edit](#) layers
- [save](#) and share your configuration and annotations with others
- [visualize](#) the results of geographic queries
- have [layers with multiple resolutions and tiles](#)
- browse and annotate [network-ready photographs](#) as well as geographic data.

In the window on the right, the GIS Viewer is being run on a set of layers relevant to the California Resources Agency's North Coast Salmon Initiative, and related work in watershed management.

Before we begin, you should make your browser's window wide enough to comfortably view the GIS Viewer and this text.

## Overview

In the center of the GIS Viewer is the main viewing canvas, in which the geographic information, or layers, are visualized. The layers that are being displayed are listed in the **Layers** column on the left. (In this application of the GIS Viewer, there are lots of different layers; you may need to use the scroll bar to see all of them.) The highlighted (so that their background is dark and the text light) layers are the ones being displayed. Initially, only a couple of layers will be on, including the "North Coast Region", "Shaded Relief (USGS)", and "Major N. Coast Water Sheds". If you click on a layer name you will toggle that layer on and off. E.g., if you click on "Russian River Region" (about fourth from the top), you should see a rectangle come on that encloses the Russian River region. Let's leave this on for



## GIS Viewer: North Coast of California

*Berkeley Digital Library Project*

---

*\*\*Please be patient while this Java applet loads.\*\**

For more information about the GIS Viewer check out our [tour](#) or our help pages. If you click on the help button within the GIS Viewer applet the help pages will come up in a separate browser window. If you click [here](#) the help pages will come up in this window.

---

[Berkeley Digital Library](#)

[www@elib.cs.berkeley.edu](mailto:www@elib.cs.berkeley.edu)



# CalPhotos

## more photos

[Plants](#)

[Fungi](#)

[Animals](#)

[People &  
Culture](#)

[Landscapes &  
Habitats](#)

[Customized  
Query](#)

## more info

[About  
CalPhotos](#)

[References](#)

This form accesses **33,851** images of plants, animals, people, and landscapes. To look for photos, choose **one or more** of the options below and click on Search. The total number of photos for each category is shown in parentheses following the category name.

You can also use the [custom query form](#) for advanced queries.

### Type of Photo

**Name**

common or scientific name

**Location**

free text description of place.

Example: *Yosemite*

**Cal. County**

**US State**

**Country**

**Continent**

**Collection**

**Photographer**

**Picture's ID**

**Reviewed**

display identification reviewed/not reviewed

**Text Only**

don't display photos; just text

CalPhotos is dedicated to the memory of [Brother Eric Vogel](#)



# Demos: Content-based Queries

*Berkeley Digital Library Project*

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The following queries use image content information alone to retrieve pictures from a collection of 50,000 images. The database query that was generated will be shown at the bottom of each page of pictures. For more information about image analysis techniques used, see [Computer Vision Research](#). To construct your own query, see [Content-based Query on all Images](#).

---

## Finding Objects in Pictures

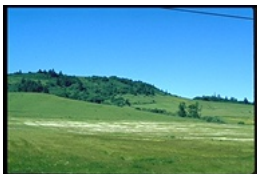


see [Finding horses using body plans](#)

## Colored Blobs and Color Percentages



*blue-green % > 30 and very sm. yellow dots > 0 and collection = corel or DWR*



*green % > 25 and lt. blue % > 25*

[Pastoral Scenes: non-Corel pictures only](#)



*sm. purple dots > 3*



*very sm. yellow dots > 15*



*lg. or very lg. pink dots > 0 and orange % > 1 and collection = corel or DWR*

# Welcome to Blobworld!

## Why Blobworld?

Very large collections of images are growing ever more common. From stock photo collections and proprietary databases to the World Wide Web, these collections are diverse and often poorly indexed; unfortunately, image retrieval systems have not kept pace with the collections they are searching. The limitations of these systems include both the image representations they use and their methods of accessing those representations to find images:

- While users generally want to find images containing particular objects ("things"), most existing image retrieval systems represent images based only on their low-level features ("stuff"), with little regard for the spatial organization of those features.
  - Systems based on user querying are often unintuitive and offer little help in understanding why certain images were returned and how to refine the query. Often the user knows only that he has submitted a query for, say, a bear but in return has retrieved many irrelevant images and very few pictures of bears.
- 

## What is Blobworld?

We have developed a new image representation, "Blobworld," and a [retrieval system](#) based on this representation. While Blobworld does not exist completely in the "thing" domain, it recognizes the nature of images as combinations of objects, and querying and learning in Blobworld are more meaningful than they are with simple "stuff" representations.

To segment an image, we model the joint distribution of the color, texture, and position features of each pixel in the image. We use the Expectation-Maximization (EM) algorithm to fit a mixture of Gaussians model to the data; the resulting pixel-cluster memberships provide the segmentation of the image. After the image is segmented into regions, a description of each region's color, texture, and spatial characteristics is produced.



# Image Classification

*Berkeley Digital Library Project*

The 14 categories shown below were chosen from the [Corel](#) image collection. About 90 pictures from each category were used for training and testing an algorithm that classifies images using [regions of coherent color and texture](#). The images used for testing are available [here](#). Use the table below to see all the images in each category and the classification of each image in a given category. For comparison, we also show the classification using color histograms.

All images in a category	Classified into a category using Blobworld	Classified into a category using color histograms
<a href="#">Airplanes</a>	<a href="#">Classified as airplanes by Blobworld</a>	<a href="#">Classified as airplanes by color histograms</a>
<a href="#">Bald eagles</a>	<a href="#">Classified as bald eagles by Blobworld</a>	<a href="#">Classified as bald eagles by color histograms</a>
<a href="#">Brown &amp; black bears</a>	<a href="#">Classified as brown &amp; black bears by Blobworld</a>	<a href="#">Classified as brown &amp; black bears by color histograms</a>
<a href="#">Cheetahs</a>	<a href="#">Classified as cheetahs by Blobworld</a>	<a href="#">Classified as cheetahs by color histograms</a>
<a href="#">Deserts</a>	<a href="#">Classified as deserts by Blobworld</a>	<a href="#">Classified as deserts by color histograms</a>
<a href="#">Elephants</a>	<a href="#">Classified as elephants by Blobworld</a>	<a href="#">Classified as elephants by color histograms</a>
<a href="#">Fields</a>	<a href="#">Classified as fields by Blobworld</a>	<a href="#">Classified as fields by color histograms</a>
<a href="#">Horses</a>	<a href="#">Classified as horses by Blobworld</a>	<a href="#">Classified as horses by color histograms</a>
<a href="#">Mountains</a>	<a href="#">Classified as mountains by Blobworld</a>	<a href="#">Classified as mountains by color histograms</a>
<a href="#">Night scenes</a>	<a href="#">Classified as night scenes by Blobworld</a>	<a href="#">Classified as night scenes by color histograms</a>
<a href="#">Polar bears</a>	<a href="#">Classified as polar_bears by Blobworld</a>	<a href="#">Classified as polar_bears by color histograms</a>



# CS Research Area: Database Management Systems

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[HOME](#)[EE](#)[CS](#)[ADMISSIONS](#)[HELP](#)[SEARCH](#)[UC BERKELEY](#)[\[Overview\]](#) [\[Themes and Projects\]](#) [\[Faculty\]](#)

## Overview

Computers are used less for computing *per se* than for the management, distribution and analysis of information. Database research thus goes to the heart of computing. Berkeley's database group maintains a long tradition of leadership that began in the early 1970s. Berkeley research projects including [INGRES](#) and [POSTGRES](#) helped define the research field, and spawned the multi-billion dollar Relational and Object-Relational database industry.

## Themes and Projects

Today, Berkeley continues to innovate in database systems research. Current efforts center around four themes:

### Data Analysis and Visualization

- The [CONTROL](#) project is developing online processing techniques to give users feedback from and control over long-running data analyses. This involves a synthesis of data delivery, statistics, and user interfaces.
- The [Tioga Datasplash](#) project investigates data visualization, and the visual construction of applications and queries.

### Distribution and Parallelism

- The [Mariposa](#) project focuses on a distributed data manager that scales to tens of thousands of sites, based on an economic model of computation.
- The [River](#) project is studying techniques to support simple, robust, high performance I/O mechanisms over clusters of

... the embedded database company

SLEEPYCAT  
SOFTWARE



Like the software? Buy the book!  
Order the Berkeley DB book on [Amazon.com](http://Amazon.com)

## Berkeley DB

Product info  
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## Search

Welcome to **Sleepycat Software**, the home of the Open Source embedded database system **Berkeley DB**!

Berkeley DB is a programmatic toolkit that provides fast, reliable, scalable, and mission-critical database support to software developers.

Berkeley DB provides data management services for some of the most demanding high-end server applications in the world. Vendors of industry-leading messaging, directory, billing and provisioning servers as well as the biggest portal, ASP and commerce sites on the Internet rely on Berkeley DB. Berkeley DB's high performance and scalability support thousands of simultaneous users working on databases as large as 256 terabytes.

At the same time, Berkeley DB's small footprint, in-process execution model, simple function-call API and low administrative overhead make it ideal for use in embedded systems. Vendors of telecommunications switches, routers and wired and wireless network gateways choose Berkeley DB to manage critical information in their products. Berkeley DB runs reliably 24 hours a day, 7 days a week in unattended systems, with no database or system administrator to oversee it.

The complete source code for Release 3.3.11 of Berkeley DB is available for immediate [download](#).

Berkeley DB includes a wide variety of APIs, including C, C++, Java, Tcl, Perl, and Python. Berkeley DB runs on a wide variety of systems, including most UNIX or UNIX-like systems, Embedix, QNX, VxWorks, and Windows 95/98/NT/2000.

*Come see us at LinuxWorld Expo at the Moscone Convention Center in San Francisco, August 28-30, in booth number 1588! [Free exhibit hall passes](#) are available from the LinuxWorld Web site.*



Emperative delivers  
network provisioning  
systems using  
Berkeley DB



# California Aerial Photos

## *Berkeley Digital Library Project*

Click on a **Flightline** to see thumbnail images for that flightline.

Description	Contractor's ID	Elib ID	Type	Flightlines	Date	Contractor	Source
California Aqueduct: East Branch	WR-BED-C	aqd_east	color	<a href="#">1</a>   <a href="#">2</a>   <a href="#">3</a>   <a href="#">4</a>   <a href="#">5</a>   <a href="#">6</a>   <a href="#">7</a>   <a href="#">8</a>   <a href="#">9</a>	Aug 03, 1994	I.K.Curtis Services, Inc.	DWR
North Bay Aqueduct	WR-AXY-C	aqd_nbay	b&w	<a href="#">1</a>   <a href="#">2</a>   <a href="#">3</a>   <a href="#">4</a>	Oct 02, 1990	Radman Aerial Surveys	DWR
South Bay Aqueduct: Livermore to Terminal Facilities	WR-AXX	aqd_sbay	b&w	<a href="#">1</a>   <a href="#">2</a>   <a href="#">3</a>   <a href="#">4</a>   <a href="#">5</a>   <a href="#">6</a>   <a href="#">7</a>	Oct 02, 1990	Radman Aerial Surveys	DWR
North Delta Flood Plain Environmental Study	WR-BBG-C	delta_nflood	color	<a href="#">1</a>   <a href="#">2</a>   <a href="#">3</a>   <a href="#">4</a>   <a href="#">5</a>   <a href="#">6</a>   <a href="#">7</a>	Feb 14, 1993	Radman Aerial Surveys	DWR
Statutory Delta	WR-BCM-CIR	delta_stat	colorIR	<a href="#">1</a>   <a href="#">2</a>   <a href="#">3</a>   <a href="#">4</a>   <a href="#">5</a>   <a href="#">6</a>   <a href="#">7</a>   <a href="#">8</a>   <a href="#">9</a>   <a href="#">10</a>   <a href="#">11</a>   <a href="#">12</a>   <a href="#">13</a>   <a href="#">14</a>   <a href="#">15</a>   <a href="#">16</a>   <a href="#">17</a>   <a href="#">18</a>   <a href="#">19</a>   <a href="#">20</a>   <a href="#">21</a>   <a href="#">22</a>	Jun 22-23, 1993	Radman Aerial Surveys	DWR



The PLANTS Gallery provides selected images of U.S. plants.

1. Choose options from the two selection boxes:

Select by Name, Symbol or Group:

Type your query. **Wildcards** are permitted.

\* for multiple characters, \_ for single characters.

Select by nativity to the US:

Select by wetland status:

Select by growth habits:

All Growth Habits

Grass or **Grasslike**

Forb/herb

Subshrub

Shrub

Vine

Tree

2. Choose viewing and sorting options:

View query results by:

Sort list or thumbnails by:

Intellectual Property Statement / How to Cite the PLANTS Database

Disclaimers

USDA non-discrimination policy

# About MVD

version 1.0alpha3

## Introduction

A "multivalent document" comprises *layers* of related data, and *behaviors*, dynamically loadable pieces of functionality. Almost all functionality is provided by the individual behaviors a document specifies. An MVD implementation (e.g., this is MVD 1.0 alpha) provides a framework within which behaviors can interoperate. You can provide whatever kind of functionality you like, or even create new kinds of documents, by writing your own behaviors and assembling them (and associated layers of information) into multivalent documents.

MVD is not document-type specific. Instead, special behaviors (called "media adaptors") are written to handle a given format. As of this point in time, we have provided media adaptors that handle scanned images, ASCII, and (a reasonable subset of) HTML. Thus you can use this MVD implementation on these document types.

Since a given MVD has its own set of layers and behaviors, we need to specify what these are. A "hub document" is the persistent version of an MVD, and contains this sort of information. Hub documents usually have the extension ".mvd". If you are already running the MVD applet, and happen to know of a hub document, you can just them MVD "File/Open" menu item to supply its name, and MVD will open it.

More likely, you are just starting out, so we provide a few shortcuts. One is that you can enter a reference to a "base layer", and MVD will do the rest. I.e., in most cases, an MVD has some "base layer", e.g., a scanned page image or an HTML page, and behaviors that make sense with this document format, and perhap some additional layers and behaviors (e.g., third party annotations.) You can supply the URL for an HTML web page--we say how below--and the applet will implicitly wrap a default hub document around it. We do the same for our collection of scanned images.

In particular, in the [UC Berkeley Digital Library Project](http://elib.cs.berkeley.edu/java/help/About.html), we have assembled a sizable collection of scanned image documents. As a way of demonstrating the sorts of things one can do with multivalent documents, we have written a number of MVD behaviors that "enliven" these scanned images. You can access the MVD version of any document in our DLIB collection simply by locating the document you want from our project server, and then either selecting MVD on that document's home page, or going to a scan page image and then clicking on the MVD con at the top or bottom of each page. (In both instances, we really happens is that a hub document is synthesized, and passed to the MVD applet call.)

For our scanned image documents, the layers include the scanned images, and the text extracted from those images by an OCR process. The behaviors specified for each document implement a wide range of functions, ranging from basic "behind the scenes" actions, such as building up the internal document structure, to performing basic document manipulation functions, such as searching, to implementing

# DLI - Santa Barbara:

---

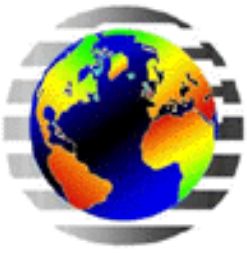
- [Home Page](#)
  - [IEEE Computer article](#)
  - [World Spatial Data](#)
  - [1994-1998 DLI-1 Project](#)
  - [H. Chen's work](#) (with "cool DL, Web, agent, visualization, and multilingual IR demos")
- 

[\[Main\]](#) [\[Contents\]](#) [\[Resources\]](#) [\[Projects\]](#)

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Please send comments/suggestions to [Ed Fox](#).

**(c) Copyright 1998-2001, Edward A. Fox, Rajat Gupta**



# Alexandria Digital Library Project

[Home](#)
[Services](#)
[Documentation](#)
[People](#)
[Related Links](#)

## Welcome

Welcome to the Alexandria Digital Library Project. The name *Alexandria* comes from the library of Alexandria, Egypt, which was considered the center of all knowledge/learning. No one place now can claim that distinction - but all data sources together (libraries, academic institutions, private companies, government agencies, etc.) are *Alexandria*. The project began in 1995 with the development of the Alexandria Digital Library, a working digital library with collections of geographically referenced materials and services for accessing those collections. The Alexandria Digital Library Project is headquartered on the campus of the [University of California at Santa Barbara](#). The Alexandria Digital Library is hosted by the [Davidson Library](#).

## Alexandria Digital Earth Prototype (ADEPT)

The National Science Foundation has announced funding from 1999-2004 for the next stage of the project, the Alexandria Digital Earth Prototype (ADEPT).

## Related Projects

[Alexandria Digital Library \(ADL\) \(1994-1999\)](#)

[ADL Gazetteer Development](#)

## Digital Library Interfaces

[California Digital Library \(CDL\): ADL Web Client](#)

[ADL Gazetteer Server](#)

THE ALEXANDRIA DIGITAL LIBRARY  
University of California, Santa Barbara  
1205 Girvetz Hall  
Santa Barbara, CA 93106, USA  
TEL: 805.893.7665 FAX: 805.893.3045  
URL: [www.alexandria.ucsb.edu](http://www.alexandria.ucsb.edu)

Last Modified: June, 2001  
[Email](#) about general project inquiries  
[Email](#) about data, metadata, and access issues  
[Email](#) about web-related comments

From *Computer* theme issue on the US Digital Library Initiative, May 1996

*ADL will provide on-line public access to maps, photos, and other information referenced in geographic terms. Much of this data currently is found only at major research libraries.*

# A Digital Library for Geographically Referenced Materials

Terence R. Smith, *University of California, Santa Barbara*

The Alexandria Project's goal is to build a distributed digital library for materials that are referenced in geographic terms, such as by the names of communities or the types of geological features found in the material. The Alexandria Digital Library (ADL) will comprise a set of Internet nodes implementing combinations of the four primary ADL architecture components--collections, catalogs, interfaces, and ingest facilities (which a digital library uses to add documents and information about document cataloging and access).

The ADL will give users Internet access to and allow information extraction from broad classes of geographically referenced materials. In this case, having access means being able to browse, view, and download data and metadata. Information extraction involves the application of local or remote procedures to selected data and metadata.

ADL's holdings focus on collections of geographically referenced materials, including maps, satellite images, digitized aerial photographs, specialized textual material (such as gazetteers), and their associated metadata. We are extending these collections to more general classes of graphical and textual materials that have references to geographic objects.

Presently, geographically referenced information is largely inaccessible. Many important collections exist only on paper or film, and the larger collections are found only in major research libraries. The University of California, Santa Barbara (UCSB), Map and Imagery Laboratory collection,

# Universe



Alexandria Digital Library: [ADL](#)

[\[comment\]](#) [\[suggestions\]](#) [\[information\]](#) [\[add a URL\]](#)

## Universe

[\[UNIVERSE\]](#) [\[EARTH\]](#) [\[AFRICA\]](#) [\[AMERICAS\]](#) [\[ANTARCTICA\]](#) [\[ASIA\]](#) [\[EUROPE\]](#) [\[OCEANIA\]](#)  
[\[By Subject\]](#) [\[By Title\]](#)

<a href="#">Earth</a>	<a href="#">Jupiter</a>	<a href="#">Mars</a>	<a href="#">Moon</a>
<a href="#">Saturn</a>	<a href="#">Sun</a>	<a href="#">Venus</a>	

## Universe

### Aerial photographs

- [Sources of Earth and Planetary Photography](http://www.nasm.edu/ceps/RPIF/RPIFsources.html)::<http://www.nasm.edu/ceps/RPIF/RPIFsources.html>

### Artificial satellites

- [Mission and Spacecraft Library](http://leonardo.jpl.nasa.gov/msl/home.html)::<http://leonardo.jpl.nasa.gov/msl/home.html>
- [STScI/HST Public Information](http://oposite.stsci.edu/)::<http://oposite.stsci.edu/>

### Astronomical - Observations

- [ESO and Space Telescope Science Archive Facilities](http://archive.eso.org/)::<http://archive.eso.org/>
- [European Southern Observatory Astronomical Information and](#)

[Events](http://www.eso.org/outreach/info-events/)::<http://www.eso.org/outreach/info-events/>

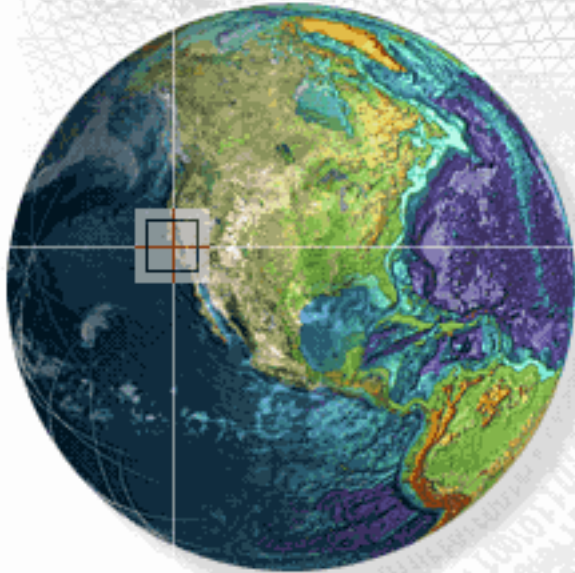
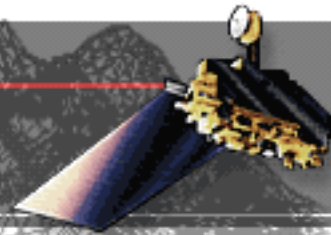
- [Mapping the Heavens: The Next Generation of Celestial](#)

[Surveys](http://spider.ipac.caltech.edu/staff/jarrett/talks/pomona/pres.html)::<http://spider.ipac.caltech.edu/staff/jarrett/talks/pomona/pres.html>

- [The Web Window to the Invisible Universe - the Radio](#)

[Sky](http://wwwwpks.atnf.csiro.au/databases/surveys/aitoff/aitoff.html)::<http://wwwwpks.atnf.csiro.au/databases/surveys/aitoff/aitoff.html>

# ALEXANDRIA DIGITAL LIBRARY



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Spatial Data  
on the Web

## THE ALEXANDRIA DIGITAL LIBRARY

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Last Modified: May 30, 1998

Our website is being redesigned and now uses some high-end browser features that may not be available in the browser you are currently using. We utilize frames and tables extensively in the new design and require a compatible browser, such as [Netscape Navigator 3.0](#) or [Microsoft Internet Explorer 3.0](#).

## personnel



### Dr. Hsinchun Chen

is a Professor of [Management Information Systems](#) at the [University of Arizona](#) and head of the UA/MIS Artificial Intelligence Group. He is also a Visiting Senior Research Scientist at National Center for Supercomputing Applications (NCSA).

He received an NSF Research Initiation Award in 1992, the Hawaii International Conference on System Sciences (HICSS) Best Paper Award, and an AT&T Foundation Award in Science and Engineering in 1994 and 1995. He received the Ph.D. degree in Information Systems from New York University in 1989.

Chen has published more than 30 articles covering semantic retrieval, search algorithms, knowledge discovery, and collaborative computing in publications such as Communications of the ACM, IEEE COMPUTER, Journal of the American Society for Information Science, IEEE Transactions on Systems, Man, and Cybernetics, IEEE Transactions on Pattern Analysis and Machine Intelligence, IEEE EXPERT, and Advances in Computers.

He is a PI of the Illinois Digital Library Initiative project, funded by NSF/ARPA/NASA, 1994-1998, and has received several grants from NSF, DARPA, NASA, NIH, and NCSA.

He is the guest editor of IEEE Computer special issue on "Building Large-Scale Digital Libraries" and the Journal of the American Society for Information Science special issue on "Artificial Intelligence Techniques for Emerging Information Systems Applications." His recent work was featured at Science ("Computation Cracks 'Semantic Barriers' Between Databases," June 7, 1996), NCSA Access Magazine, HPCWire, and Business Week.

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- [Robin Sewell](#)

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- [Chienting Lin](#)
- [Dmitri Roussinov](#)
- [Dorbin Ng](#)
- [Kristin Tolle](#)
- [Marshall Ramsey](#)
- [Mick McQuaid](#)
- [Michael Chau](#)
- [Rosie Hauck](#)
- [Thian-Huat Ong](#)

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- [Andy Clements](#)
- [Gondy Leroy](#)
- [Harry Li](#)
- [Harsh Gupta](#)
- [Hend Dwiyo](#)
- [Kevin Kraus](#)
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- [Two-page Summary](#)
- [Curriculum Vitae](#)

- [Photos: AI Lab Members](#)
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- [High-Performance Computing for Digital Library Lecture](#)
- [Illinois Digital Library Initiative Status Report](#)

Class URLs for Fall 1998:

- [MIS 531A -- Data Structures and Algorithms](#)
- [MIS 480/580 -- Knowledge Management: Technologies and Practices.](#)



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# DLI - Illinois:

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- [IEEE Computer article](#)
- [Glossary](#)
- [SGML/XML Home Page](#), [SD Unit Notes in CS5604](#), [SoftQuad Products](#)
- Collections: [Publishers](#), [Software Companies](#)
- [Interspace](#)
- [Social Science Team Home Page](#)
- [DeLiver](#)
  - Before using DeLiver you should get one of the following 2 files and install it on your Windows 95/NT system. Be sure to have any version of Netscape closed after the download, when you do the install. These files are local to VT to save you the time of downloading as per the U. Ill. instructions. The Panorama versions each take about 1.9M for the install package but less than 1M for the C: drive installed version Netscape.
  - Explore the DeLiver pages, and try to answer the following questions.
  - What does the Help tell you about the system?
  - What is the coverage?
  - What are unusual services not provided by similar systems?
  - What is Panorama and what does it do to enhance WWW capabilities?
  - Can you use browsing to find the IEEE-CS articles (i.e., v. 29 n. 5) we looked at for this course?
  - Can you use searching to find the IEEE-CS articles we looked at for this course?
  - How does the presentation using WWW and Panorama differ from that you are familiar with (HTML, PDF)? What benefits are there from having Panorama?
  - What other interesting articles about digital libraries did you find?
  - Is the field specific searching of help?

Is the interface for DeLiver easy to understand? How could it be improved?

---

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---

Please send comments/suggestions to [Ed Fox](#).

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# UIUC Digital Library Testbed

[Browse the Collection](#)

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[University of Illinois at Urbana-Champaign](#)

[Grainger Engineering Library](#)

[Digital Library Testbed](#)

[Coordinator: Tom Habing](#)

5/12/00 TGH

From *Computer* theme issue on the US Digital Library Initiative, May 1996

*A University of Illinois project is developing an infrastructure for indexing scientific literature so that multiple Internet sources can be searched as a single federated digital library.*

# Federating Diverse Collections of Scientific Literature

Bruce Schatz, William H. Mischo, Timothy W. Cole, Joseph B. Hardin, Ann P. Bishop, *University of Illinois*  
Hsinchun Chen, *University of Arizona*

The most important recorded information medium on the Internet, and in the world at large, is the document. Although text might seem prosaic in contrast to multimedia objects, it is still the major medium for communicating information. Internet document retrieval can draw upon years of research results and practical experience in on-line information access as well as from traditional physical libraries. The technology for text information retrieval is far more mature than that for other media. Therefore, documents are also the best vehicle for investigating problems specific to digital libraries, such as the federation problem of making distributed collections of heterogeneous materials appear to be a single integrated collection.

The Digital Library Initiative (DLI) project at the University of Illinois at Urbana-Champaign is developing the information infrastructure to effectively search technical documents on the Internet. We are constructing a large testbed of scientific literature, evaluating its effectiveness under significant use, and researching enhanced search technology. We are building repositories (organized collections) of indexed multiple-source collections and federating (merging and mapping) them by searching the material via multiple views of a single virtual collection.

Developing widely usable Web technology is also a key goal. Improving Web search beyond full-text retrieval will require using document structure in the short term and document semantics in the long term. Our testbed efforts



# Glossary

## [ARPA \(DARPA\)](#)

The Defense Advanced Research Projects Agency (DARPA) is the central research and development organization for the Department of Defense (DoD). It manages and directs selected basic and applied research and development projects for DoD, and pursues research and technology where risk and payoff are both very high and where success may provide dramatic advances for traditional military roles and missions and dual-use application.

## **Broad System of Ordering (BSO)**

A general subject classification scheme, commissioned by UNESCO, intended to be a switching language among existing classification schemes and thesauri to make them mutually compatible on a general level. It provides about 4,000 subdivisions.

## **Collection Interface Agent**

A program which interacts with the Collection Registry. For searchable collections (Z39.50, FTL, ...) it takes care of talking to the remote collection, submitting searches, fetching and processing results. It is also referred to as a CIA or a collection agent.

## **Collection Registry**

The database in which descriptions of collections are stored.

## **Concept Space**

Graph of terms occurring within objects linked to each other by the frequency with which they occur together.

## [Corporation for National Research Initiatives \(CNRI\)](#)

A non-profit organization dedicated to formulating, planning, and carrying out national-level research initiatives on the use of network-based information technology. CNRI is concentrating on research and development for the National Information Infrastructure, working collaboratively with industry, academia, and government.

## **Derived Data**

Data that was originally supplied in one form, but was converted to another form using some automated process.

## **DID**

Document Image Decoding, a methodology for document recognition founded on statistical communication theory.

## **Digital Libraries**

Digital libraries basically store materials in electronic format and manipulate large collections of those materials effectively.

## [Digital Library Federation](#)

The Federation is comprised of leaders of fifteen of the nation's largest research libraries and archives and the Commission on Preservation and Access ([CPA](#)). A primary goal of the Federation is the implementation of a distributed, open digital library accessible across the global Internet. The library will consist of collections expanding over time in number and scope to be created from the conversion of digital form of documents contained in founding member and other

**Last modified:**

August 24, 2001

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XLink

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CSS

HyTime

Search

# the XML COVER PAGES

*Robin Cover, Managing Editor*

Hosted by:



*The XML Cover Pages* is a comprehensive online reference work for the Extensible Markup Language (XML) and its parent, the Standard Generalized Markup Language (SGML). The reference collection features extensive documentation on the application of the open, interoperable "markup language" standards, including XSL, XSLT, XPath, XQuery, XLink, XPointer, XHTML, HyTime, DSSSL, CSS, SPDL, SVG, CGM, ISO-HTML, and others.

*The XML Cover Pages* is currently [sponsored](#) by [OASIS](#) (Organization for the Advancement of Structured Information Standards) and four OASIS Members: [Altova Inc.](#), [DataChannel/ISOGEN](#), [Software AG](#), and [Sun Microsystems](#).

## What's New...

Read the [most recent SGML/XML news . . .](#)

## Overview

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is provided by:



### The XML Cover Pages

- [Site Index](#)
- [Site Description](#)
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# UNIT SD

## Course Notes on SD Unit --- SGML, Document Processing/Translation

---

### SGML and Document Processing

#### Word Processing

#### Document Management

#### Markup, OHCO

#### SGML

### Summary - SGML and Document Processing

- Word Processing - providing data
  - Document Management - bigger issue than IS&R (e.g., OIS)
  - Markup Approaches - use last 3
  - SGML - brief introduction
  - Advantages of SGML -> adoption
  - Document modeling - open problem
- 

### Document Translation

#### Electronic Publishing

## Products

### MarketAgility Enterprise

MarketAgility Enterprise gives you the power and control you need to collect, manage and deliver customized product information to multiple e-marketplaces and e-procurement systems. Using powerful XML technology, which SoftQuad helped pioneer, MarketAgility Enterprise allows companies of all sizes to compete and thrive in the new economy. [Find out more.](#)



### XMetaL

XMetaL, the most advanced, easy to use XML content creation solution, is the premier enabler for XML content applications in e-commerce, e-publishing and knowledge management. [Find out more.](#)



### HoTMetaL PRO

HoTMetaL PRO is the world's most versatile Website creation and management tool. Powerful, customizable and extensible, HoTMetaL PRO 6.0 gives professional developers the advanced capabilities and productivity tools needed to quickly create sophisticated sites. [Visit hotmetalpro.com](http://hotmetalpro.com) to find out more.



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[Academic Press, Inc.](#)

[American Association for the Advancement of Science \(AAAS\)](#)

[American Astronomical Society \(AAS\)](#)

[American Chemical Society \(ACS\)](#)

[American Institute of Aeronautics and Astronautics \(AIAA\)](#)

[American Institute of Physics \(AIP\)](#)

[American Physical Society \(APS\)](#)

[American Society of Agricultural Engineers \(ASAE\)](#)

[American Society of Civil Engineers \(ASCE\)](#)

[American Society of Mechanical Engineers \(ASME\)](#)

[Institution of Electrical Engineers \(IEE\)](#)

[Institute of Electrical and Electronics Engineers \(IEEE\)](#)

[IEEE Computer Society](#)

[John Wiley & Sons](#)

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[DLI Home](#) | [DLI National Synchronization](#) | [DL Related Information](#)

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University of Illinois at Urbana-Champaign Digital Libraries Initiative

Comments to: External Relations Coordinator, [Tom Habing](#)

01/18/98



[Hewlett Packard](#)

[Microsoft](#)

[NETBILL \(Electronic Payment Scheme\)](#)

[OpenText \(Search Engine\)](#)

[Interleaf \(Panorama, an SGML viewer\)](#) formerly

a [SoftQuad](#) product

---

[DLI Home](#) | [DLI National Synchronization](#) | [DL Related Information](#)  
[Glossary](#) | [Information Science](#) | [Interspace](#) | [Testbed](#) | [User Evaluation](#)

University of Illinois at Urbana-Champaign Digital Libraries Initiative  
Comments to: External Relations Coordinator, [Tom Habing](#)

01/18/98

## INTERSPACE

### Summary

NEW

Darpa PI Meeting Project Summary

*The Interspace Prototype:  
An Analysis Environment for  
Semantic Interoperability*

for more information

INTERSPACE

architectures

proposal

research &amp; demonstration

**The Net of the Twenty-First Century** must permit users to directly solve their information problems. Hypermedia browsing has now become widespread and search facilities are beginning to appear. Users are now building information repositories on a grand scale. This will soon lead to a global information space consisting of a billion repositories.

(See [Evolution of the Net](#).) What will this future world be like? How will we locate and correlate information in such a vast space?

The **Interspace Research Project** is developing a prototype environment for semantic indexing of multimedia information in a testbed of real collections. The semantic indexing relies on statistical clustering for concepts and categories. Interactive navigation based on semantic indexing enables information retrieval at a deeper level than previously possible for large, diverse collections. We are in the process of developing algorithms for automatically [extracting concepts](#) and computing [Concept Spaces](#), [Category Maps](#), and performing [Concept Assignment](#). Our collections include engineering literature, map images, and medical literature. The Interspace Prototype will thus enable scalable, interactive semantic interoperability across subject domain, media type, and collection size.

# Welcome to the DLI Social Science Team Home Page

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Progress](#)[Conference  
Presentations](#)[Site Visit  
and  
Quarterly  
Reports](#)[Main DLI  
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DeLiver](#)

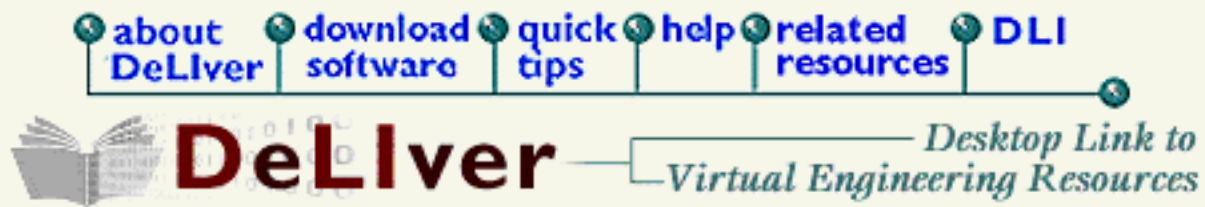
This page consists of links to working papers and [a brief overview of the social science team](#) projects that we have been working on as the social science team for the NSF/ ARPA/ NASA [Digital Library Initiative project](#) being conducted at the University of Illinois.

Our subgroup of the Illinois Digital Library Initiative (DLI), the Social Science Team, has a mandate to study potential and actual use of prototype systems that other subgroups of the DLI build. In addition, we study the web more generally, and how the work of engineers and other scientist will be impacted by and will impact the growth of the information infrastructure.

Our Social Science Team has articulated, from the beginning, a commitment to a three way relationship between users, designers and social scientists, following in a general way the principals of participatory design. We are especially concerned with trying to fit our formative evaluation work to the ideal of this method: close contact and communication between designers and users via a series of mutually generated, iterative prototypes. To this end, we have conducted usability studies with the emergent testbed; observations of current users of electronic systems in the traditional library and beyond; focus groups, interviews and observations with faculty and staff who are potential users; and as use of the testbed continues to grow, transaction log analyses. One of our major concerns is finding a means to fit these all together.

Members of the team include: Ann Bishop, primary investigator; [Leigh Star](#), investigator; Emily Ignacio, graduate assistant; Laura Neumann, graduate assistant; [Cecelia Merkel](#), a graduate assistant; [Bob Sandusky](#), graduate assistant; and Eric Larson, graduate assistant.

send comments or  
questions to: [l-  
neuma1@uiuc.edu](mailto:l-neuma1@uiuc.edu)



## Connecting from Off-Campus IP Address

Welcome to [DeLiver](#), a **FREE**, grant supported system, providing access to the full-text of articles from over 50 journals in civil engineering, computer science, electrical engineering, and physics. Off-campus access to the DeLiver testbed is currently limited to University of Illinois at Urbana-Champaign faculty, staff, and students and to selected other users directly affiliated with the DeLiver project. Faculty and students at other institutions participating in the trial of DeLiver will only be able to connect to the testbed from computers located on their home campus. Select the type of user you are from the following choices:

[\[about deliver\]](#) - [\[download software\]](#) - [\[quick tips\]](#) - [\[help\]](#) - [\[related resources\]](#) - [\[DLIhome\]](#)

University of Illinois at Urbana-Champaign Digital Libraries Initiative  
Comments and Questions to: [DeLiver Web Master](#)

# University of Michigan Digital Library Activities

## DLI General Information

- [Home Page](#)
- [IEEE Computer article](#)
- [Introduction](#)
- [Current Status](#)
- [Technologies](#)
- [Agents, Ontologies](#)

## Campus Strategy

- Partnership of
  - [University Library](#)
  - [Information Technology Division](#)
  - [School of Information](#)
- combine: R&D; technology infrastructure; content access & user services; outreach
- shift to 21st century library model
  - user-centric, collaborative teams, global reach
  - distributed collections, heterogeneous access protocols, just-in-time information delivery
  - mixed funding models, value = access + services
- [Gateway Registry](#)
- [Electronic Reserve Shelf](#)
- [Knowledge Navigation Center](#): develop and support teaching and learning projects
- Questions:
  - How does the infrastructure at U. Michigan compare to that at your university?
  - How does this strategy relate to previous services of libraries?

## Projects

- [JSTOR](#): Journal Storage: over 1.2M pages
- [Making of America](#): with Cornell - 5K volumes, [D-Lib article](#): scanning, OCR, SGML encoding, tif2gif, interface
- [DLPS Image Services](#): see also V. 5 N. 8 Oct. 1996 [Information Technology Digest](#)
- [Humanities Text Initiative](#)
- [Papryology](#)
- [Middle English Compendium Demo](#)
- [American Verse](#)

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**PROJECT**

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**WELCOME TO THE**  
**UNIVERSITY OF**  
**MICHIGAN'S DIGITAL**  
**LIBRARY. HERE YOU**  
**WILL FIND THE LATEST**  
**NEWS IN WHO WE**  
**ARE, WHAT WE ARE**  
**DOING, AND WHERE**  
**WE ARE GOING.**

**Digital Library Initiative**

**University of Michigan**

From *Computer* theme issue on the US Digital Library Initiative, May 1996

*In the University of Michigan Digital Library, interacting software agents cooperate and compete within a virtual information economy to provide library services to students, researchers, and educators.*

# Toward Inquiry-Based Education Through Interacting Software Agents

Daniel E. Atkins, William P. Birmingham, Edmund H. Durfee, Eric J. Glover, Tracy Mullen, Elke A. Rundensteiner, Elliot Soloway, José M. Vidal, Raven Wallace, and Michael P. Wellman, *University of Michigan*

Providing true access to the human record means offering relevant information without prohibitive search time or an overwhelming choice among sources. Conventional libraries provide such access through two mechanisms: information organization and librarian services. Librarians themselves often rely on services like information systems or bibliographic databases to do their jobs.

Digital libraries must likewise provide organizational schemes and a wide variety of services. Most observers focus on the vast amount of information digital libraries will offer, delivered in new and interesting ways. However, we believe it is the bounty of services that will ultimately demonstrate the potential of digital libraries.

The University of Michigan Digital Library (UMDL) project[\[1\]](http://computer.org/computer/dli/r50069/r50069.htm) is creating an infrastructure for rendering library services over a digital network. When fully developed, the UMDL will provide a wealth of information sources and library services. Of course, we cannot anticipate all the services that will eventually constitute a digital library. We therefore designed the UMDL to let third-party developers expand the library with new services and collections.

## MISSION INTRODUCTION

*"A study of history shows that civilizations that abandon the quest for knowledge are doomed to disintegration."*

*-Bernard Lovell: The Observer, 'Sayings of the Week', 14 May 1972*

Combining traditional notions of libraries with contemporary technological capabilities (such as the WWW) is a meeting of dissimilars. Libraries have traditionally stressed service, organization, and centralization. The WWW has embodied flexibility, rapid evolution, and decentralization. Digital libraries somehow need to bring these together.

Much digital library work has begun from the centralized, structured view of a library and sought to provide access to the library through digital means. In the University of Michigan Digital Library Project (UMDL) we believe that this approach loses the advantages of decentralization (geographic, administrative), rapid evolution, and flexibility that are hallmarks of the web. In UMDL, we are instead embracing the open, evolving, decentralized advantages of the web and introducing computational mechanisms to temper its inherent chaos. However, we are also embracing the traditional values of service, organization, and access that have made libraries powerful intellectual institutions.

The challenges we face are providing an infrastructure that lets patrons (and publishers) feel like they are working within a library, with the traditional emphasis on providing service and organized content, when in fact the underlying space of goods and services is volatile, administratively decentralized, and constantly evolving. Moreover, the decentralized and flexible infrastructure can be exploited to allow information goods and services to evolve in a much more rapid, diverse, and opportunistic way than was ever possible in traditional libraries, for the good of consumers and providers.

In the UMDL we are meeting these challenges by defining and incrementally developing interfaces and infrastructures for users and providers such that intellectual work (finding, creating, and disseminating knowledge) is embedded in a persistent, structured context even though the underlying networked system is evolving. The infrastructure supports extensible ontologies (meta descriptions of collections and services) for allowing components in the digital library to self-organize, dynamically teaming to form structures and services that users need. Principles from economics are also being used to efficiently allocate resources and provide incentives for

## ACCOMPLISHMENTS CURRENT STATUS

*"A man of destiny knows that beyond this hill lies another and another. The journey is never complete."*

*-F.W. de Klerk*

### IPE

We are currently deploying experimental economic mechanisms within SMS, the UMDL's Service Market Society. Agents exchange library resources and services through the market, with prices determined through a distributed auction process. Research on pricing of intellectual property is ongoing through the [PEAK project](#).



### Conspectus

#### Ontology

We have developed a high level ontological description of intellectual work, using as our foundation an intellectual work hierarchy, originally developed by IFLA, the International Federation of Library Associations, now heavily modified. This hierarchy provides us with a core set of concepts from which we can describe intellectual work, services, and rights.

#### Metadata set

We have in use a metadata set useful for online textual, image, and multimedia materials, which is updated and modified in conjunction with changes in the ontology.

#### Beethoven

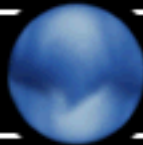
We have started mapping the MARC metadata of over 450

## UMDL TECHNOLOGIES

Research for the University of Michigan Digital Library Project focuses on the following:

- **ARCHITECTURE: AGENTS AND ONTOLOGIES**
- **ACCESS: ARTEMIS INTERFACE**
- **CONTENT: COLLECTIONS**
- **ECONOMY: COMPUTATIONAL MARKETS**
- **ADVANCED USER INTERFACE**
- **CONSPECTUS & IR**
- **PRODUCTION SYSTEM**

MISSION•ACCOMPLISHMENTS•IN ACTION



UMDL TECHNOLOGIES•IMPACT•TEAM

**UMDL TECHNOLOGIES**  
**ARCHITECTURE: AGENTS AND ONTOLOGIES**

*"Architecture in general is frozen music."  
-Friedrich von Schelling*

A library serves a community of users by making available information content and services that are valued by that community. A traditional, physical library is thus not simply a building that houses information, but rather a complex configuration of information goods and services that have been carefully selected and organized around the needs of a user community.

In a digital library, the content and services are electronically available, and user communities are no longer geographically defined. Realizing a digital library therefore includes difficulties in digitizing contents, computerizing services, and networking together users. Even if these difficulties are overcome, however, the result can well be an overwhelming tangle of possible information sources without the structure and selectivity that renders a traditional library navigable. In other words, if the administration of a traditional library is challenging, the administration of a digital library can border on impossible due to the magnitude of content and services available, the rate of change in what is available, and the size and evolution of a user population that is not bounded by physical proximity.

One answer to this challenge is to rely on traditional methods that put administrators at the center of the enterprise, to attract, register, and track a user community, to seek and include the content that will benefit the community, and to provide the most valuable services for tasks, such as organizing, searching, abstracting, and disseminating the content. An alternative approach, however, is to move as much of the administration into the digital infrastructure as possible. The goal of this approach is to provide mechanisms by which a digital library can continually reconfigure itself as users, contents, and services come and go. These mechanisms should encourage:

- **Flexibility:** They should be able to embody a wide variety of policies to realize different flavors of libraries (public, corporate, university, personal,...)
- **Extensibility:** Providers and consumers of information goods and services should have incentives to join the library and abilities to find their counterparts.
- **Scalability:** As the plethora of users, goods, and services grows, the underlying, computerized administration of the library should not bog down.



## Ready Reference Shelf

This page provides you with quick links to some basic electronic reference sources. For a complete list of many additional resources, see the Library's [Networked Digital Resources](#) page.

[Encyclopedias and Factual Reference](#) || [Writing and Spelling Directories](#) || [Book & Journal Bibliographic Sites](#)

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### Encyclopedias and Factual Reference

#### [Encyclopedia Britannica](#)

- **Coverage:** Current edition. Updated daily.
- **Description:** Encyclopaedia Britannica's latest article database (including hundreds of articles not found in the print edition), Merriam-Webster's Collegiate Dictionary, and the Britannica Book of the Year (1994- ), with thousands of web links selected by editors.
- **Access:** Limited to UM network (on-campus & dial-in).

#### [McGraw-Hill Encyclopedia of Science and Technology](#)

- **Coverage:** Seventh edition of 1992.
- **Description:** Contains the full text of the print edition, comprised of nearly 7000 articles on topics ranging from aeronautics to zoogeography written by major experts, introducing both basic and advanced concepts.
- **Access:** Limited to authorized UM users (through validated sign-on).

#### [World Almanac](#)

- **Coverage:** Current edition. Updated annually.
- **Description:** Combines all the general facts, brief profiles and data included in the

[Text Only Version](#)

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- 
- **Hours for the summer term are 11am - 5pm, Monday - Friday.**

### **Recent additions to the site:**

[Dissertation Resources](#)

---

Last updated on April 26, 2001

[knc-info@umich.edu](mailto:knc-info@umich.edu)



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# Making of America



[Go to MoA Books](#)



[Go to MoA Journals](#)

**M**aking of America (MOA) is a digital library of primary sources in American social history from the antebellum period through reconstruction. The collection is particularly strong in the subject areas of education, psychology, American history, sociology, religion, and science and technology. The collection currently contains approximately 8,500 books and 50,000 journal articles with 19th century imprints. The project represents a major collaborative endeavor in preservation and electronic access to historical texts.

The Making of America collection is made up of images of the pages in the books and journals. When you find something you want to look at, you will see a scanned image of the actual pages of the 19th century volume. Optical Character Recognition (OCR) has been performed on the images to enhance searching and accessing the texts -- for more on the OCR process see [About MOA](#).

Making of America is growing and changing. Over five thousand new titles have been added, bringing Making of America to over two and a half million pages online. For a short time, the journals and books will be divided into two separate collections; you will not be able to search both at once.

Making of America is made possible by a grant from the Andrew W. Mellon Foundation.

**MOA**  
*about*



*contact*

[Authorized User Login](#)

 Your search form will be:     **Simple**     **Boolean**

 Below, select the collections to search, and then click Continue.
 

---

 U of M  
Collections

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[Bentley Historical Library](#) [ world ]

[Poetry Here and Then: Bentley Historical Library](#) [ world ]

[Making of Ann Arbor](#) [world]

[Media Union Library](#)
[History of Art, Visual Resources Collections](#)
[Borobudur: History of Art, Visual Resources Collections](#) [ world ]

[Kelsey Museum of Archaeology: Registry Database](#) [ world ]

[Amulets: Kelsey Museum of Archaeology](#) [ world ]

[Special Collections Library, University of Michigan](#) [ world ]

[Brut](#) [ world ]

[Students on Site](#) [ world ]

[Asian Art Archives](#)
[Southeast Asia Art Symposium](#) | available during symposium only

[Southeast Asia Art Foundation Archive](#) [world]

[Images from Indonesia](#) [world]

[African American Music Collection](#)
[Miscellaneous](#) | A handful of maps [ world ]

[APIS \(Advanced Papyrological Information System\)](#) [ world ]

 The previous version of [APIS](#) will remain available until March 15.



The Humanities Text Initiative, a unit of the University of Michigan's [Digital Library Production Service](#), has provided online access to full text resources since 1994. The Humanities Text Initiative (HTI) is an umbrella organization for the creation, delivery, and maintenance of electronic texts, as well as a mechanism for furthering the library community's capabilities in the area of online text.

- ♦ *text collections*
- ♦ *Making of America*
- ♦ *sgml resources*
- ♦ *about HTI*

The collections on this site are freely available to the Internet community. Resources which are restricted to use by University faculty, staff, and students only can be found at the [Encoded Text Services](#) website.

This site is made possible in part by a generous equipment grant from



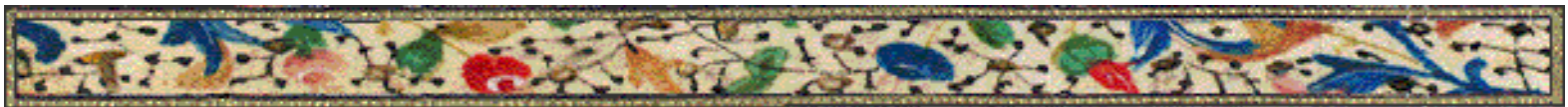
The Middle English Compendium has been designed to offer easy access to and interconnectivity between three major Middle English electronic resources: an electronic version of the Middle English Dictionary, a HyperBibliography of Middle English prose and verse, based on the MED bibliographies, and an associated network of electronic resources.

- [HyperBibliography](#)
- [Middle English Dictionary](#)
- [Corpus of Middle English Prose and Verse](#)
- [Related Resources](#)
- [About the Middle English Compendium](#)
- [Help with Using this Resource](#)

**November 1999 Release:** [What's New](#)

For information about institutional site licenses, please see the [University of Michigan Press website](#).

**This project has been** [funded by a grant](#) **from the** [National Endowment for the Humanities](#).



[A note on the MS image.](#)

[mec-info@umich.edu](mailto:mec-info@umich.edu)

Last updated 4 November 1999.



- **Try out the Book-Bagged Amverse!** An interface for searching only personally selected works in the collection
- **Simple Searches:** Single word and phrase searches throughout the entire American Verse Project collection
- **Boolean Searches:** Find combinations of two or three words in a given line of verse or single paragraph
- **Proximity Searches:** Find the co-occurrence of two or three words or phrases
- **Browse the American Verse Project Texts**
- **The HTI's Bibliography to American Poetry**
- **The Critical Environment**
- **About the American Verse Project**

---

The American Verse Project is a collaborative project between the University of Michigan Humanities Text Initiative (HTI) and the [University of Michigan Press](#). The project is assembling an electronic archive of volumes of American poetry prior to 1920. The full text of each volume of poetry is being converted into digital form and coded in Standard Generalized Mark-up Language (SGML) using the TEI Guidelines, with various forms of access provided through the WWW. In recognition of the effort

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## RESEARCH

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## Major Collaborative Research Projects

Many research projects at the School of Information involve several faculty, sometimes including faculty from outside the School. In this section we list the major collaborative projects. Individual faculty projects can be found in the faculty research interest section.

### Collaboratories

A collaboratory is a distributed research center in which scientists in several locations are able to work together with the assistance of communication and collaboration technologies. The School of Information is home to a number of such projects. An [article](#) by Finholt & Olson discusses the concept of collaboratories in more detail. A special issue of [Interactions](#) (May-June, 1998), an online journal devoted to human-computer interaction, discusses a number of collaboratory projects.

- [SPARC](#) (formerly UARC) -- The **Space Physics and Aeronomy Research Collaboratory** is one of the Internet's premier collaborative research efforts. Space physics researchers around the world control and gather data from more than a dozen instruments across -- and above -- the globe. Along with this smorgasbord of live data comes direct access to the most advanced supercomputer models of upper atmospheric phenomena, and a set of state-of-the-art communication tools, including "chat rooms" and a shared white-board utility. SPARC is funded by the National Science Foundation. Contact: Gary M. Olson ([gmo@umich.edu](mailto:gmo@umich.edu))
- [Great Lakes CFAR](#) -- The **Great Lakes Center for Aids Research**, one of 17 CFARs nationally, is the first to join multiple AIDS researchers and their institutions through a collaboratory. Researchers from the University of Michigan, Northwestern University, the University of Wisconsin, and the University of Minnesota will share their knowledge through the collaboratory. The Great Lakes CFAR is funded by the National Institutes of Health. Contact: Stephanie Teasley ([steasley@umich.edu](mailto:steasley@umich.edu))
- The **Pritzker Evaluation and Assessment of a Brain Science Collaboratory**, funded by the Pritzker Foundation, supports a distributed group of multidisciplinary researchers at Michigan, Cornell, and Stanford studying causes of and cures for psychological depression. SI is evaluating scientific and collaborative practices among the collaboratory participants, evaluating the selection of collaboration tools that fit existing and anticipated practices, and conducting an assessment of the impact of the collaboration tools in use. Contact: Thomas Finholt ([finholt@umich.edu](mailto:finholt@umich.edu))
- [MedCollab](#) -- The NSF-funded **Medical Collaboratory** engages

# Electronic Records

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[Electronic Records 1996: Conference Information](#)

New On The Site!

[Astra's Sesam Report](#)

[Report from Electronic Records Conference](#)

[Electronic Record Research](#)

---

Information: [Margaret Hedstrom](#) or [Mark Handel](#)

**UMDL TECHNOLOGIES**  
**ADVANCED USER INTERFACE**

*"Language and knowledge are dissolubly connected; they are interdependent."*  
*-Annie Sullivan*

The Advanced User Interface group of the University of Michigan Digital Library project employs user centered approaches to push the state of the art in human computer interaction for information seeking. We are building visually rich, highly interactive, and multiperson interfaces to support the extended information gathering and organizing tasks, not just the traditional "one-shot query." We also seek to inform the general UMDL research community about future collections and services that its agent architecture might provide to support such advanced interfaces.

Our current designs focus on compelling new methods of interaction, one built on the multiscale (infinite pan and zoom) platform of [PAD++](#), and another on a distributed multi-person computing environment with a feel much like a MOO, called [CCR](#).

## Visual Querying of Digital Library Information

- This research prototype system explores a visually rich interface for querying and navigation in a personal workspace containing digital library information. In particular, it investigates the synergy between querying and navigation. This is demonstrated by allowing any object to be used to query any set of objects anywhere in the workspace, by retaining the structure while displaying query results to allow navigation, and by allowing a smooth transition between the two tasks.
- Sample Task Scenario: A university professor is preparing an astronomy lecture. She has written an outline and is looking for images to illustrate a point. She uses words from her outline to query the information space, then continues with her lecture, alternating between authoring, browsing and navigating as appropriate.

# UMDL Ontology Concept Descriptions

This document is a forum for ongoing work on the [University of Michigan Digital Library \(UMDL\) ontology](#). It defines the ontology concepts in stylized natural language. Other online sites related to the ontology include:

- The [ontology implemented](#) in description logic using [Loom](#).
- A java interface to a [knowledge-base of metadata](#), generated from US MARC records on works by or about Beethoven.
- An interface for developers using the UMDL [Service Classifier Agent](#), which maintains a "dynamic ontology" of agent capabilities.

## Last modification on 12/18/97:

- Added links to the implemented ontology, and to the Beethoven Project.
- Removed the form for accumulating comments online. The idea was nice, but to communicate effectively it would be better to [mail the ontology group](#).

## Coming next:

- Revisions to respond to changes made during implementation of the ontology in Loom for the Beethoven Project.

## Concept definitions by area

[Generic Digital Library](#)

[Content](#)

[Work](#)

[Stages of Realization](#)

[Collection Metadata](#)

[Genre](#)

[Publishing Format](#)

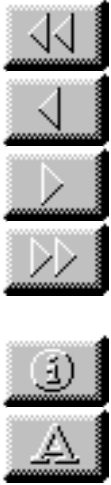
[Digital Format](#)

[Ontogeny](#)

[Containment](#)

[Roles](#)

## Learning Agents in the UMDL



**José M. Vidal and Edmund H. Durfee**  
**University of Michigan**  
**Artificial Intelligence Laboratory**



The University of Michigan, Ann Arbor, Site Visit May 21, 1997

6/3/97-

Slide 1 of 7

# SGML Creation and Delivery

## The Humanities Text Initiative

Christina Kelleher Powell  
Humanities Text Initiative  
[sooty@umich.edu](mailto:sooty@umich.edu)

Nigel Kerr  
Digital Library Production Services  
[nigelk@umich.edu](mailto:nigelk@umich.edu)

Harlan Hatcher Graduate Library, Room 301  
University of Michigan  
Ann Arbor, Michigan

**D-Lib Magazine**, July/August 1997

ISSN 1082-9873

- 
- [What is the HTI?](#)
  - [Text Creation in SGML](#)
    - [The American Verse Project](#)
    - [Corpus of Middle English Prose and Verse](#)
  - [SGML Delivery via the Web](#)
  - [SGML Services to Others](#)
  - [Future Directions](#)
    - [Cross-Collection Searching](#)
    - [Multiple Representations of Data](#)
    - [More Focus on Humanities](#)
  - [Related Readings](#)

---

## What is the HTI?



# TI SGML and TEI

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The collections on this site are freely available to the Internet community. Resources which are restricted to use by University faculty, staff, and students only can be found at the [Encoded Text Services](#) website.

## Guides to SGML

- [TEI Guidelines for Electronic Text Encoding and Interchange \(P3\)](#)
- [SGML Primer \(Interleaf\)](#)
- [A Gentle Introduction to SGML \(from TEI Guidelines\)](#)

♦ *text collections*

♦ *Making of America*

♦ *about HTI*

## Bibliographies and related resources

- [Robin Cover's "SGML Web Page"](#)
- [SGML Declaration - Online Tutorial](#)
- [SGML Tools](#)
- [Technical Paper](#) documenting WWW-to-PAT Gateway
- [Midwest SGML Forum, Detroit Chapter](#)



# Just-in-time Conversion, Just-in-case Collections

## Effectively leveraging rich document formats for the WWW

John Price-Wilkin  
Head, Digital Library Production Service  
University of Michigan  
Ann Arbor, Michigan  
[jpwilkin@umich.edu](mailto:jpwilkin@umich.edu)

D-Lib Magazine, May 1997

ISSN 1082-9873

- 
1. [Introduction](#)
  2. [Why on-the-fly?](#)
    - 2.1 [Converting for actual use, not potential use](#)
      - 2.1.1 [Case 1: Grolier's \*Encyclopedia Americana\*](#)
      - 2.1.2 [Case 2: Making of America](#)
    - 2.2 ["Re-purposing" and managing data](#)
      - 2.2.1 [Flexible delivery](#)
      - 2.2.2 [Collection management](#)
  3. [Conclusion](#)
- 

## 1. Introduction

The University of Michigan's Digital Library Production Service (DLPS) has developed substantial experience with dynamic generation of Web-specific derivatives from non-HTML sources based on several key projects and consideration of how users work with key resources. This article is based on DLPS's experience and resultant policies and practices that guide present and future projects. In a rapidly changing world where the implications of information technologies for broad yet differentiated clienteles are mysterious, we hope that our experience will contribute to a better understanding of practical strategies.

The WWW has long included the ability to offer access to documents stored in formats other than HTML. Beginning with NCSA's "htbin" mechanisms, and soon after using the now widely embraced Common Gateway Interface (CGI), managers of large document collections have been able to store materials in a variety of formats, while offering these documents to a wide consumer base. This was the model used by the author in 1993 (when NCSA introduced Mosaic) to build access to large collections of documents stored in a variety of forms of SGML.<sup>1</sup> Once CGI was introduced, in fact, the Internet quickly saw the introduction of gateways to popular enterprise database systems such as Oracle, and a variety of other data types such as numeric data files (e.g., [American National Election Studies](#)).

A fundamental part of this strategy is the real-time creation of Web-friendly versions of material in formats not natively

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Above: the interior dome of the Main Reading Room at the Library of Congress  
For an [online tour of the Jefferson Building](#), click on the dome.

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- American Memory <http://lcweb2.loc.gov/>
  - Call/Awards about American Memory <http://lcweb2.loc.gov/ammem/award/>
  - Sponsors and Contributors to the National Digital Library Program  
<http://lcweb2.loc.gov/ammem/sponsors.html>
- 

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Please send comments/suggestions to [Ed Fox](#).

**(c) Copyright 1998-2001, Edward A. Fox, Rajat Gupta**

[The Library of Congress](#)



## [Collection Finder](#)

Select collections to search

## [Search](#)

Search for items across all collections

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Teaching and learning with American Memory

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American Memory is a gateway to rich primary source materials relating to the history and culture of the United States. The site offers more than **7 million digital items** from more than 100 historical collections.

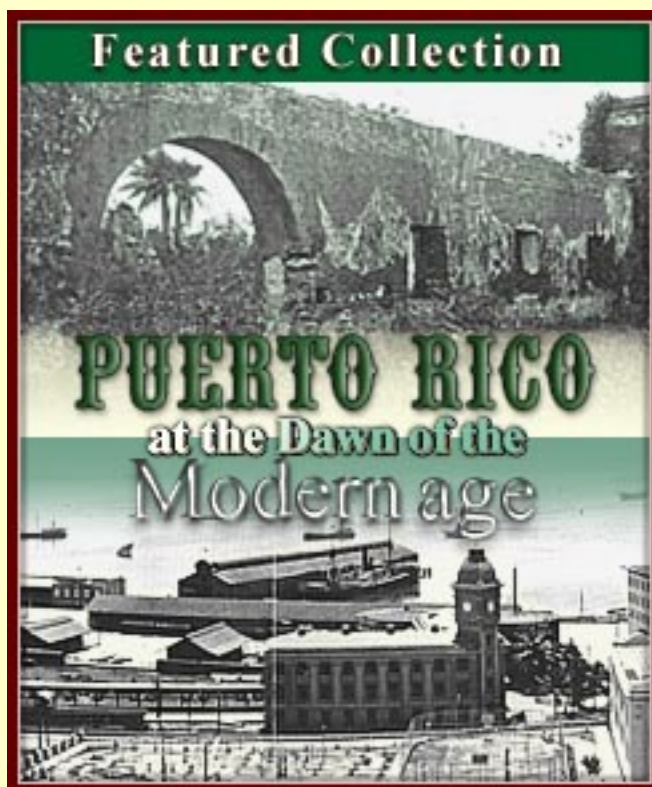
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[Technical Information](#)

[Future Collections](#)

Search  
example  
of the day:  
[Stephen Foster](#)



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**ARTICLES**

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## D-Lib Magazine March 2001

Volume 7 Number 3

ISSN 1082-9873

# Open Linking in the Scholarly Information Environment Using the OpenURL Framework

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[Oren Beit-Arie](#)

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## Abstract

This paper provides insights into the concepts underlying the OpenURL framework for open reference linking in the web-based scholarly information environment. The discussion starts by briefly reiterating the problems with reference linking that were initially described and later addressed as part of the SFX research. Some notions crucial to the understanding of the issues at stake are briefly described: extended service-links, closed and non-context-sensitive linking, open and context-sensitive linking. Then, the paper details the OpenURL framework and reports on its current deployment in the scholarly information environment. As an illustration of the penetration of the OpenURL framework, special attention is accorded to a prototype in which the OpenURL framework is integrated with the DOI/CrossRef linking solution.

## Introduction

This paper provides insights into the concepts underlying the OpenURL framework for open reference linking in the web-based scholarly information environment. The OpenURL framework has its roots in the SFX-research conducted by Herbert Van de Sompel and his colleagues at Ghent University, Belgium, from 1998 to 2000.

This discussion starts by briefly reiterating the problems with reference linking initially described and later addressed as part of the SFX research. Notions at the core of the SFX research are described: extended service-links, closed and non-context-sensitive linking, and open and context-sensitive linking.

Next, the paper details the OpenURL framework for open linking and reports on its current deployment in the scholarly information environment. A key component in the OpenURL framework is the OpenURL. The OpenURL provides a standardized format for transporting bibliographic metadata about objects between information services.

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[www.archives.gov](http://www.archives.gov)



## [American Originals](#)

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• On July 5, 2001, the Rotunda closed for renovation and will reopen in 2003. Our research areas will remain open throughout the renovation.

[More...](#)

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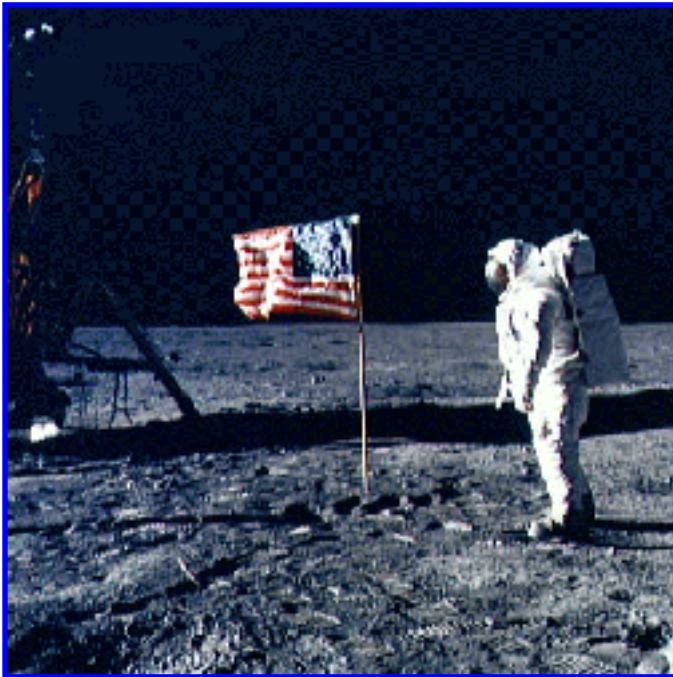
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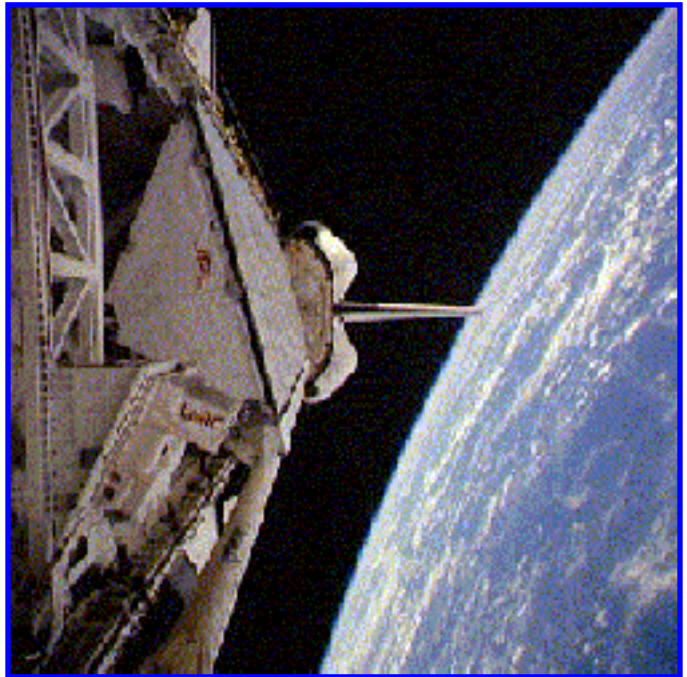


**Welcome** to the NASA JSC Digital Image Collection. Each Shuttle mission produces 2000 to 5000 photographic images. Over 250,000 images have been captured, digitized, and stored. Learn more [about this collection](#) and [the JSC digital imaging project](#). NASA generally does not assert copyright, however learn more [about conditions for use of images](#). Now [full text search](#) capabilities are implemented. A [graphical browser](#) for all cataloged Shuttle Earth Observation images is also available. (NOTE: Digital images are not available for all images referenced by the graphical browser.) The [NASA Photo Gallery](#) is an attempt to bring all of NASA's still images to one location.

Check out the new [Earth from Space](#) page, containing high quality earth observation images and detailed captions!



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# National Science, Mathematics, Engineering, and Technology Education Digital Library (NSDL)

## Overview

**digital library:** "A managed environment of multimedia materials in digital form, designed for the benefit of its user population, structured to facilitate access to its contents, and equipped with aids to navigate the global network ... with users and holdings totally distributed, but managed as a coherent whole."

--Mel Collier, *International Symposium on Research, Development, and Practice in Digital Libraries 1997*

Building on work supported under the multi-agency Digital Libraries Initiative, this program aims to establish a national digital library that will constitute an online network of learning environments and resources for science, mathematics, engineering, and technology (SMET) education at all levels. The program will accept proposals in four tracks: (1) A *Core Integration* project is expected to focus on the coordination and management of the library's core collections and services and to develop the library's central portal. (2) *Collections* projects are expected to aggregate and manage a subset of the library's content within a coherent theme or specialty. (3) *Services* projects are expected to develop services which support users, collection providers, and the Core Integration effort and which enhance the impact, efficiency, and value of the library. (4) *Targeted Research* projects are expected to explore specific topics that have immediate applicability to one of the other three tracks.

## Deadlines

Formal proposals: **April 17, 2002 (anticipated)**



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## **NSF SMETE-Lib Study**

The SMETE-Lib Study is an initiative of the National Science Foundation's Division of Undergraduate Education to examine the potential impact of digital libraries on science, mathematics, engineering, and technology education (SMETE), with emphasis at the undergraduate level. Depending upon the outcome, the study may lead to the implementation of digital library services for undergraduate education.

[SMETE-Lib Study](#)

[Report of the SMETE Library Workshop](#)

[Steering Committee Private Area](#)

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*The SMETE-Lib web pages and mailing list are hosted by [D-Lib](#) with support from NSF's Division of Undergraduate Education.*



wya/bw

*Last revised: November 2, 1998*



# NSDL Program: Related Digital Library Projects

Below are links to the abstracts of previously funded digital library projects with an emphasis on resources for undergraduate education.

## Evaluation of digital library prototypes: processes and linkages in support of a core integration system

- [Award No. 9980116](#): Agogino, UC-Berkeley, \$399,999, "Developing a Prototype National Digital Library for Science, Mathematics, Engineering, and Technology Education"
- [Award No. 9817406](#): Agogino, UC-Berkeley, \$200,000, "Using the National Engineering Education Delivery System as the Foundation for Building a Test-bed Digital Library for Science, Mathematics, Engineering, and Technology Education"

## Evaluation of the impact of digital library tools on teaching and learning

- [Award No. 9909086](#): Druin, University of Maryland, \$613,337 (co-funded with ESIE), "Digital Libraries for Children"
- [Award No. 9817432](#): Smith, UC-Santa Barbara, \$5.8 million (co-funded with CISE; DUE's contribution: \$500,000), "Alexandria Digital Earth Prototype"
- [Award No. 9816026](#): Maly, Old Dominion University, \$80,355, "Planning Grant for the Use of Digital Libraries in Undergraduate Learning in Science" [[Project Web site](#)]

## Evaluation of business models for sustainability of library resources

- [Award No. 9979967](#): Wittenberg, Columbia University Press, \$581,068, "Columbia Earthscape: A Model for a Sustainable Online Educational Resource in Earth Sciences"

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## Premier Courseware of 2001

## Premier Courseware of 2001 Call for Submissions

**Deadline: Friday July 13, 2001**



NEEDS is seeking submissions for the 2001 Premier Award for Excellence in Engineering Education Courseware. Now in its fifth year, this award co-sponsored by [John Wiley and Sons](#) seeks to recognize high-quality, non-commercial courseware designed to enhance engineering education.

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**FIND:** Know what you want? Find your learning resource quickly.

**RESEARCH:** Not sure what you want? Start your search here.

**BROWSE:** Just looking? Browse through our extensive collection.

Come and Join the **SMETE.ORG Community**

Welcome to the SMETE Digital Library.

The most comprehensive collection of science, math, engineering and technology education content and services.

News

SMETE.ORG is an e-learning partnership that offers a comprehensive collection of science, math, engineering and technology (SMET) education content and services to learners, educators, and academic policy-makers. SMETE.ORG was formed through funding by the National Science Foundation and partnerships with nationally recognized professional educational organizations, academic institutions and private e-learning companies. Providing direct access and delivery of instructional resources, SMETE.ORG promotes SMET educational reform through participatory communities of learners.

Community

The National SMETE Digital Library Community Center was initiated as a result of several workshops on the subject hosted by the National Science Foundation. The purpose is to gather and share information from all concerning existing SMETE digital libraries, tools and services, lessons learned, standards used, user studies and publications.

<http://www.needs.org/> (1 of 2) [8/25/2001 5:14:19 AM]



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<b>2001 PKAL F21 National Assembly</b>  <b>October 19 - 21 2001</b>  Madison, WI	<b>Science at the Cutting Edge</b> <i>Bringing Advances in Science and Technology into the Undergraduate SME&amp;T Learning Environment:</i>  Environmental Science - Biotechnology Materials Science - Information Technology
----------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**Project Kaleidoscope** (PKAL) is an informal national alliance working to build strong learning environments for undergraduate students in mathematics, engineering and the various fields of science. Toward that end, PKAL sponsors an annual series of **Summer Institutes** that provide opportunities for faculty, administrators and other stakeholders to:

- ▶ identify key questions and issues to be addressed in the process of strengthening students learning in these fields
- ▶ share 'what works' - effective practices in creating, adapting, implementing and assessing new approaches
- ▶ share materials emerging from the work of leading agents of change.

We start here a series of brief reports from the 2001 Summer Institute. These will be posted irregularly to encourage broader dialogue about critical issues that must be addressed by those serious about the quality and character of student learning on their campuses and across the nation.



#### August 23: Reporting on Facilities Planning as an Integral Part of Ensuring Institutional Vitality, Serving All Students, and Providing a Coherent Program for Majors (all Institute Series).

[Acrobat \(PDF\) Format](#) / [Plain HTML Format](#)

In taking its kaleidoscopic perspective on building strong natural science communities, PKAL has always given attention to the character and quality of the spaces in which learning and teaching take place. During the 2001 Summer Institute, we were pleased to have the participation of several architects, as well as exhibits of recent science facilities projects from design firms around the country. These exhibits illustrated how issues relating to the shape of academic programs also affect the shape of spaces for science. For example:



- ▶ this is an efficient organization of space that place the "student zone" directly at the center of the plan among the offices, so that students could bump into faculty and meet informally; office block exteriors are anchored by powerful corner towers that are synergistically related to other campus buildings.



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# Windows to the Universe

Welcome to *Windows to the Universe*! Our purpose is to develop a fun and different Web site about the Earth and Space sciences. *Windows to the Universe* is **graphics intensive**! Entry options here lead to the **Intermediate** content level. Click 'Preference' once inside the site to change your view settings.

**Note: Our site has moved to a new address**

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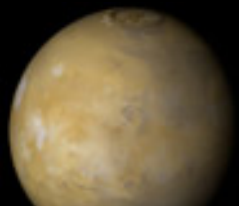


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# Old Dominion University Digital Library Research Group

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The Old Dominion University Digital Library Research Group is active in a number of areas which aim to make digital libraries (DLs) easier to use, both for publishers and retrievers. We are interested in DL tools, DL interoperability, and DL architecture. Our research is supported by the [NSF](#) and [NASA](#). We especially work closely with NASA Langley Research Center, the Lead Center for Scientific and Technical Information in NASA.

## NCSTRL+

In this project we are creating the infrastructure forming an association of digital libraries within NASA Langley to support intelligent digital objects and clustering based on the successful distributed architecture of Networked Computer Science Technical Reference Library (NCSTRL). We have designed and implemented clusters and bucket technologies, that allow for the integration of multi-discipline and multi-format NASA Scientific and Technical Information holding (STI).

Our core technology testbed is [NCSTRL+](#), a set of tools and extensions from [NCSTRL](#). NCSTRL+ implements two significant technologies: *clusters* and *buckets*. Clusters allow for arbitrary combining and partitioning of collections along axes such as subject category, archival type, publishing organization and terms and conditions.

- An overview of NCSTRL+ published in [ADL 98](#)
- [NCSTRL+ ODU testbed](#) (This testbed consists of various collections and is to be used for illustration of the search interface only; the other tools are early versions - go to NCSTRL+ NASA testbed)
- [NCSTRL+ NASA testbed](#) (This testbed has only one collection with a few objects but has the latest set of tools to support the entire life cycle of digital objects)
- [Start up scripts and instruction for NASA and ODU servers](#) (Password required, if interested, please email to [dlibug@cs.odu.edu](mailto:dlibug@cs.odu.edu))



# Technology for Education 2000

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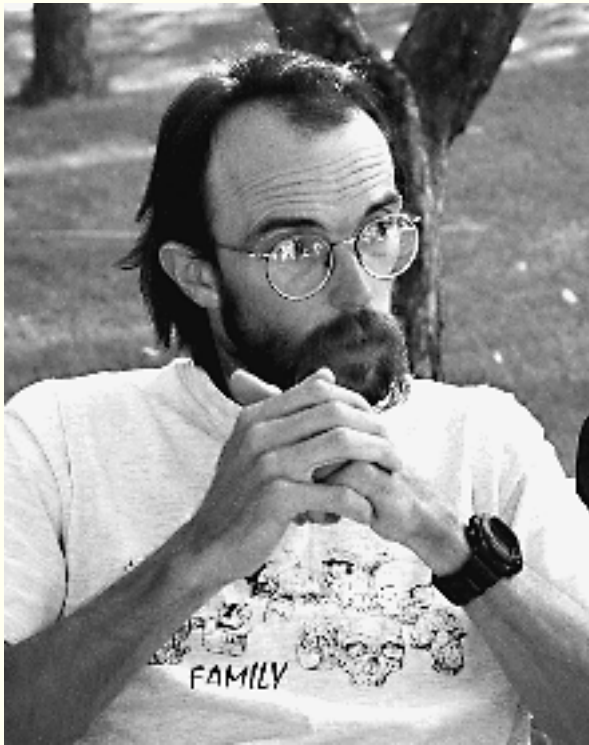
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# Virtual Multimedia Labs and Exams in Physical Anthropology

--John Kappelman, Department of Anthropology  
[jkappelman@mail.utexas.edu](mailto:jkappelman@mail.utexas.edu)

*This is the third in a series of vignettes describing the use of instructional technologies at UT Austin. --Editor*

Advances in computer technology and multimedia software now permit instructors to significantly extend the range of materials and exercises for lectures and laboratory assignments, as well as for evaluations of learning. This combination offers a new approach to teaching, one that integrates both learning and evaluation processes. Some examples of this approach in physical anthropology are presented below.



*John Kappelman*

## Variability in Lab Resources

One of the centerpieces of any science course is its laboratory component. The quality of a laboratory clearly depends upon available equipment, materials, and supplies that can be found in the college or university. But there is great variability in different departments' holdings of materials, equipment, and collections of specimens, especially in physical anthropology. For example, because there are wide disparities in collections of osteological and fossil cast materials, as well as access to living primates, the content of introductory physical anthropology laboratories varies widely among different programs.

## Computer-Enhanced Techniques Used

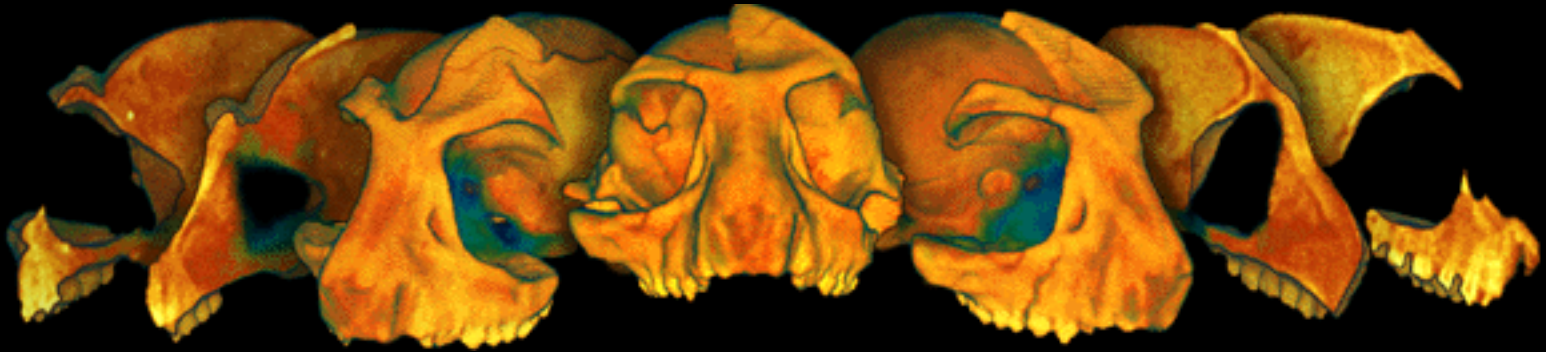
One solution to the problem of limited holdings of lab materials is found in digital technology and in recent advances in computer storage hardware and multimedia software. My lab group, with the generous support of the National Science

Foundation, the Intel Corporation, and the University of Texas, has been engaged in mastering laboratory curricula for physical anthropology on CD ROM. This work culminated in the 1998 release of *Virtual Laboratories for Physical Anthropology* (Wadsworth Publishing Company). These multimedia materials (including still images, video footage, sound, and 3-D animations) and text are mastered as laboratory exercises that

*The University  
of Texas at  
Austin  
Department of  
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DIGITAL MORPHOLOGY GROUP

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## Digital Library Initiatives

The Library is undertaking a wide range of digital initiatives that can be broadly classified under the following strategies:

- Initiatives to provide long term access to publications that are first produced in a digital form;
- Initiatives to increase access to the National Library's collection through digitisation of traditional format library materials; and,
- Initiatives to facilitate a greater understanding of digital issues.

See also the stocktake report [Online Content/Convergence Initiatives](#) prepared for Heads of Cultural Organisations.

- [Long Term Access to Digital](#)

### Related Links

[NLA Electronic Information Resources Strategies and Action Plan 2001-2002](#)

[Australian Digitisation Projects](#)

[NLA Digitisation Policy 2000 - 2004](#)

[Digitisation of traditional format library materials](#)

[Digital Services Project](#)

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## Bibliotheca universalis

# Bibliotheca universalis

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### ● Partners

**Bibliotheca Universalis** is one of the eleven G-7 projects.

The **seven** founding partners of the project are :

- [Bibliothèque nationale de France](#) and [Ministère de la Culture et de la Communication](#) (France, pilot),
- [National Diet Library](#) (Japan, pilot),
- The [Library of Congress](#) (United States),
- The [National Library of Canada](#) (Canada),
- Discoteca di Stato (Italy),
- [Die Deutsche Bibliothek](#) (Germany),
- [The British Library](#) (UK).

**Five** new partners have joined the project :

- [Bibliothèque Royale Albert 1er](#) (Belgium)
- [Národní knihovna České republiky](#) (Czech Republik)
- [Koninklijke Bibliotheek](#) (Netherlands)
- [Biblioteca Nacional](#) (Portugal)
- [Biblioteca Nacional](#) (Spain)
- [Bibliothèque nationale suisse](#) (Suisse)

And **two** observers :

# The British Library Digital Library Programme

## Towards the Digital Library

The development of the digital library will enable the British Library to embrace the digital information age with its increasing proliferation of, and demand for, digital products and services. Digital technology will be used extend the Library's unparalleled collection to include digital media and to preserve such material for the national archive. Access to the collection will become boundless with users from all over the world, at any time, having simple, fast access to digitised materials using computer networks, particularly the Internet. The British Library's initiative will contribute to the creation of a national digital information network together with the [New Library: The People's Network](#) public library initiative and the [National Grid for Learning](#) plan.

Following the end of the Digital Library PFI Project in December 1998, the Library has been exploring alternative solutions to its digital library requirements.

The Library must ensure that it is able to meet its users' expectations. The Library needs to collect, store, preserve and provide access to the increasing amount of digital material that is being published. Voluntary deposit of certain types of digital works will begin later this year. The library and information community is moving ahead with the *National Grid for Learning* - to connect schools to the internet - and the *People's Network* - to provide digital services from public libraries. As the national library we must play our part in such an important realignment of information services both in the UK and overseas.

The Library is responding to this challenge by beginning a procurement for the necessary digital infrastructure to underpin its strategic and service ambitions in this area. A Notice has recently been published in the Official Journal of the European Communities (OJEC) asking for expressions of interest in tendering for the contract. The contract is to provide a Digital Library System (DLS) to support new and enhanced products and services based on digital information.

The Digital Library System (DLS) will be an extensive and hospitable IT system to enable the Library to meet its strategic and operational objectives in relation to the collection of digital materials and the provision of access to them as follows:

- It will enable the Library to store, preserve and provide access to the UK digital published output, whether acquired through purchase or through extension of Legal Deposit. It will support the full volume projections for digital publications required for the Library's collection. It will be the basis of the UK national digital archive.

[What's New](#)[About CIDL](#)[Committees](#)[Activities](#)[Resources](#)[Français](#)

# Canadian Initiative on Digital Libraries

## A National Alliance

### What Is CIDL?

The Canadian Initiative on Digital Libraries (CIDL) is an alliance of Canadian libraries that recognize the growing importance of digital information. By collaborating, these libraries can ensure better use of digital information and better service to their users. The alliance was first proposed at a national meeting of 20 Canadian libraries held at the National Library of Canada in March 1997.

### CIDL's Mission

The Canadian Initiative on Digital Libraries will promote, coordinate and facilitate the development of Canadian digital collections and services in order to optimize national interoperability and long-term access to Canadian digital library resources.

### CIDL's Objectives

- Formulate and implement strategies towards increased communication and education on digital library matters;
- Promulgate digital library standards and best practices;
- Define methods to improve coordination of activities and avoid duplication in the development of digital resources;
- Establish strong relations with others in the information arena: creators, publishers, information technology industries, archives, museums, cultural agencies, government agencies at all levels, and individual and institutional users;
- Raise awareness of Canadian digital library activities, both within and outside Canada.

### CIDL's Work

- Coordinated development of digital collections and services
- Digitization best practices
- Rights management
- Roles and responsibilities for long-term archiving
- Access policies and practice
- End-user access technical requirements



# Networked Digital Library of Theses and Dissertations

---

Universities, students, publishers, other interested parties, Welcome!

- Researchers, see <http://www.theses.org/> to **search** and **browse** our digital library of electronic theses and dissertations (ETDs).
- Students, see <http://etd.vt.edu/> for help creating and submitting ETDs.

## What We Are

- An [initiative](#) to improve graduate education, increase sharing of knowledge, help universities build their information infrastructure, and extend the value of digital libraries
- A federation of [members](#)
- A project [supported by FIPSE and SURA](#)
- A [project team](#) based at [Virginia Tech](#)
- A recent topic in the [news](#)
- Led by a [steering committee](#) and working [committees](#).

## Our Objectives

- **To improve graduate education** by allowing students to produce electronic documents, use digital libraries, and understand issues in publishing
- **To increase the availability of student research** for scholars and to preserve it electronically
- **To lower the cost** of submitting and handling theses and dissertations
- **To empower students** to convey a richer message through the use of multimedia and hypermedia technologies
- **To empower universities** to unlock their information resources
- **To advance digital library technology**

## What We Do at Virginia Tech

- Require students to develop and submit Electronic Thesis or Dissertations (ETDs)
- Provide a [web site](#) to help students
- Support a [digital library](#) of ETDs
- Develop a [workflow model](#) for submitting ETDs
- Develop an [XML DTD](#) for ETDs
- Give [talks](#)
- Write [papers](#)

## Further Information

- **NEW** final report on US Dept. of Educ. funded project, 11/30/99, in [PDF](#) and [Word](#) formats.
- General and historical [information](#)
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# Digital Library Network (DLnet)

[in Japanese](#)

Welcome to Digital Library Network Homepage. Here, we present programs and records of the series of workshops on Digital Libraries at University of Library and Information Science, Tsukuba Science City, Japan.

Digital Library Network (DLnet) was proposed at the First Workshop on Digital Libraries on August 31, 1994, to provide free-access forum on Digital Libraries. We welcome your comments and questions to DLnet.

## English Pages

- [DL Workshop Program](#)
- [Titles and Abstracts from Digital Libraries \(ISSN 1340-7287\)](#)
- [ISDL'99: International Symposium on Digital Libraries 1999](#)
- [ISDL'97: International Symposium on Research, Development & Practice in Digital Libraries 1997](#)
- [International Symposium on Digital Libraries 1995](#)  
(August 22 - 25, 1995 at ULIS)

## Japanese Pages

- [DLnet HomePage](#)
- [International Symposium on Digital Libraries 1995](#)  
(August 22 - 25, 1995 at ULIS)
- [DL Workshop](#)
- [Digital Libraries \(ISSN 1340-7287\)](#)

## Others

- [DLnet Gopher Server](#)
- [DLnet Anonymous-FTP Server](#)
- [Roadmap Lessons \(In Japanese\)](#)
- [JAPAN/MARC Search experiment at ULIS](#)
- [Multilingual-HTML Browser Project](#)


# National Museum of Ethnology, OSAKA, JAPAN

The National Museum of Ethnology (**Minpaku**, short for *Kokuritsu Minzokugaku Hakubutsukan*) was established in 1974 as an Inter-University Research Institute under Monbusho, Ministry of Education, Science, Sports, and Culture.

The general functions of Minpaku are

- ethnological (anthropological) research
- the collection and conservation of ethnographic materials
- public exhibition.

With these activities, the museum aims to promote a general understanding and awareness of people, societies and cultures throughout the world.

 [MINPAKU Anthropology Newsletter](#) is published semi-annually, in June and December. The Newsletter promotes a continuing exchange of information with 'Minpaku fellows' who have been attached to the Museum as visiting scholars from overseas. The Newsletter also provides a forum for communication with a wider academic and anthropological audience.

**Japanese**

 **information**

 **Route Map**

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**m@il**

**Minpaku Web Site** [<http://www.minpaku.ac.jp/>]



# The Online Computer Science Library

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## Information about the MeDoc Project

Objectives; Architecture; Organization; Requirements; Sponsoring Publishers

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# WORKING GROUPS

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## Joint NSF-EU Working Groups on Future Directions of Digital Libraries Research

The DELOS Working Group, part of the ERCIM Digital Library Initiative, is funded by the ESPRIT Long Term Research Programme within the Fourth Framework Programme of the Commission of the European Union. Its objective is to promote research into the further development of digital library technologies, in particular to: stimulate research activities in areas which are relevant for the efficient and cost-effective development of digital library systems, encourage collaboration between research teams working in the field of digital libraries, and establish links with on-going projects and activities in the field of digital libraries in industry and other public and private institutions.

The DELOS Working Group is collaborating with NSF (US) research groups so as to jointly explore technical, social and economic issues, plan common research agendas, share research results, and explore national, technical, and social expectations about digital libraries. Five working groups have been set up addressing the areas of interoperability between digital library systems, metadata, intellectual property rights and economic issues, resource indexing and discovery in a globally distributed digital library, and multilingual information access.

### An International Research Agenda for Digital Libraries

### Summary Report of the Series of Joint NSF-EU Working Groups on Future Directions for Digital Libraries Research

**October 12, 1998**

**Editors: Peter Schäuble and Alan F. Smeaton**

### Working Group Members

#### Co-organizers:

Dan Atkins, University of Michigan, USA  
Costantino Thanos, IEI-CNR, Italy

#### Intellectual Property and Economics:

# UK Electronic Libraries Programme ([eLib](#))

- There are online [working papers](#)
- It is funded by the Joint Information Systems Committee (JISC).
- It is based on the Libraries Review by the UK Higher Education Funding Councils, chaired by Professor Sir Brian Follett in 1993. They prepared the [Joint Funding Council's Libraries Review Group Report, Prof. Sir Brian Follett, HEFCE, 1993](#).
- As a response, JISC started eLib with 15 million pounds over 3 years, to engage the Higher Education community in developing and shaping the implementation of the electronic library.
- There have been 2 separate calls and over 60 projects in areas:
  - access to network resources
  - digitisation
  - document delivery
  - electronic journals
  - electronic short loan collections
  - images
  - on demand publishing
  - pre-prints and grey literature
  - quality assurance
  - supporting studies
  - training and awareness
- One part is the [Arts and Humanities Data Service](#) and its service for the Visual Arts.
- On preservation, a workshop was held, with report Long Term Preservation of Electronic Materials: a JISC/British Library workshop as part of the Electronic Libraries Programme, Organised by UKOLN, 27-28 November 1995, U. of Warwick, prepared by the Mark Fresko Consultancy, 1995, also available [online](#).
- [Ariadne](#) is an eLib ejournal providing current information on eLib and digital libraries in general.

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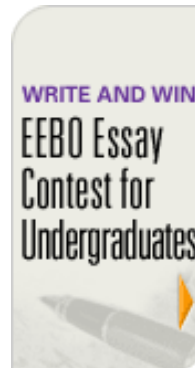
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**ScienceDirect OnSite**

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## Start Using ResearchIndex (CiteSeer)

ResearchIndex is a scientific literature digital library that aims to improve the dissemination and feedback of scientific literature, and to provide improvements in functionality, usability, availability, cost, comprehensiveness, efficiency, and timeliness.

Rather than creating just another digital library, ResearchIndex provides algorithms, techniques, and software that can be used in other digital libraries. ResearchIndex indexes Postscript and PDF research articles on the Web, and provides the following features.

Summary of ResearchIndex (formerly CiteSeer)	
<b>Autonomous Citation Indexing (ACI)</b>	ResearchIndex uses ACI to autonomously create a citation index that can be used for literature search and evaluation. Compared to traditional citation indices, ACI provides improvements in cost, availability, comprehensiveness, efficiency, and timeliness. For more details, see <a href="#">Autonomous Citation Indexing</a> .
<b>All cited documents</b>	ResearchIndex computes citation statistics and related documents for all articles cited in the database, not just the indexed articles.
<b>Reference linking</b>	As with many online publishers, ResearchIndex allows browsing the database using citation links.
<b>Citation context</b>	ResearchIndex can show the context of citations to a given paper, allowing a researcher to quickly and easily see what other researchers have to say about an article of interest.

<b>Awareness and tracking</b>	ResearchIndex provides automatic notification of new citations to given papers, and new papers matching a user profile.
<b>Related documents</b>	ResearchIndex locates related documents using citation and word based measures and displays an active and continuously updated bibliography for each document.
<b>Similar documents</b>	ResearchIndex shows the percentage of matching sentences between documents.
<b>Full-text indexing</b>	ResearchIndex indexes the full-text of the entire articles and citations. Full boolean, phrase and proximity search is supported.
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<b>Freely available</b>	The full source code of ResearchIndex is available at no cost for non-commercial use.

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# OCLC Office of Research

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## Our mission

**The mission of the Office of Research** is to expand knowledge that advances OCLC's public purposes of furthering access to the world's information and reducing library costs.

This mission is achieved through the integration of computer, library, and information sciences into research activities including experimentation, prototyping, standardization advancements, studies, and research collaborations.

Areas of interest

- [What's new](#)
- [OCLC/RLG Digital Preservation Commons](#)
- [Dublin Core Metadata Initiative](#)
- [Web Characterization Project](#)

---

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## Self-study Courseware on

# Digital Libraries

## Contents

**Introduction:** This WWW site has been developed to assist those interested in learning about digital libraries. It is based upon materials tested in 2 Virginia Tech courses taught Fall 1997 (and again in revised form in Fall 2000):

- [CS6604](#)
- [Honors 3004](#)

Students in those courses especially liked Michael Lesk's "[Practical Digital Libraries: Books, Bytes & Bucks](#)" so we refer to it as a supplemental text throughout this site.

There is a set of quizzes to test your knowledge of the chapters in Dr. Lesk's book, prepared to work with WhizQuiz, but that is no longer in use. For the Fall 2000 digital library courses at Virginia Tech, quizzes in CourseInfo were developed and can be made available from the instructor. These cover two books: the one by Lesk and the one by Arms.

---

**Revisions:** This site will undergo frequent changes, so do check back. The latest revision was completed 6/21/2001.

**Acknowledgements:** This WWW site was developed in part through funding from NSF grants CDA-9312611, DUE-9752408, and DUE-9752190.

Please send comments/suggestions to [Ed Fox](#).

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# CS Dept. NSF-Supported Education Infrastructure Project / ei.cs.vt.edu

Welcome to the home page for the [NSF](#) supported project "Interactive Learning with a Digital Library in Computer Science". We hope you find some of the results of our project useful! Please [send me comments and suggestions](#)! Thanks, Prof. E. A. Fox.

- [Courses](#) (over 40, with over 10K files)
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- [Search ei.cs.vt.edu etc. \(e.g., all courses\)](#)
- [National EI Projects Home Page](#)
- [Computer Science Teaching Center](#)
- [Curriculum Resources in Interactive Multimedia](#)
- [Computer Science Education Innovation Workshop](#)

June 15-21, 1997

- QUIZIT [Software and thesis](#)

;

Papers:

- [QUIZIT: An interactive online quiz system for WWW-based instruction](#) - Tinoco, L. C., Fox, E. A., Ehrich, R. W, Fuks, H. In Proceedings of the VII Brazilian Symposium on Educational Technology. Belo Horizonte, Brazil, Nov. 1996.
- Online Evaluation in WWW-based Courseware - Tinoco, L. C., Fox, E. A., Barnette, N. D. In Proceedings ACM SIGCSE'97, San Jose, Feb. 1997:  
[paper in PDF](#), [presentation in PowerPoint](#)
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# Envision

The Envision Project was funded as **A User Centered Database from the Computer Science Literature** by NSF for 1991-95. ACM has provided free access to their publications.

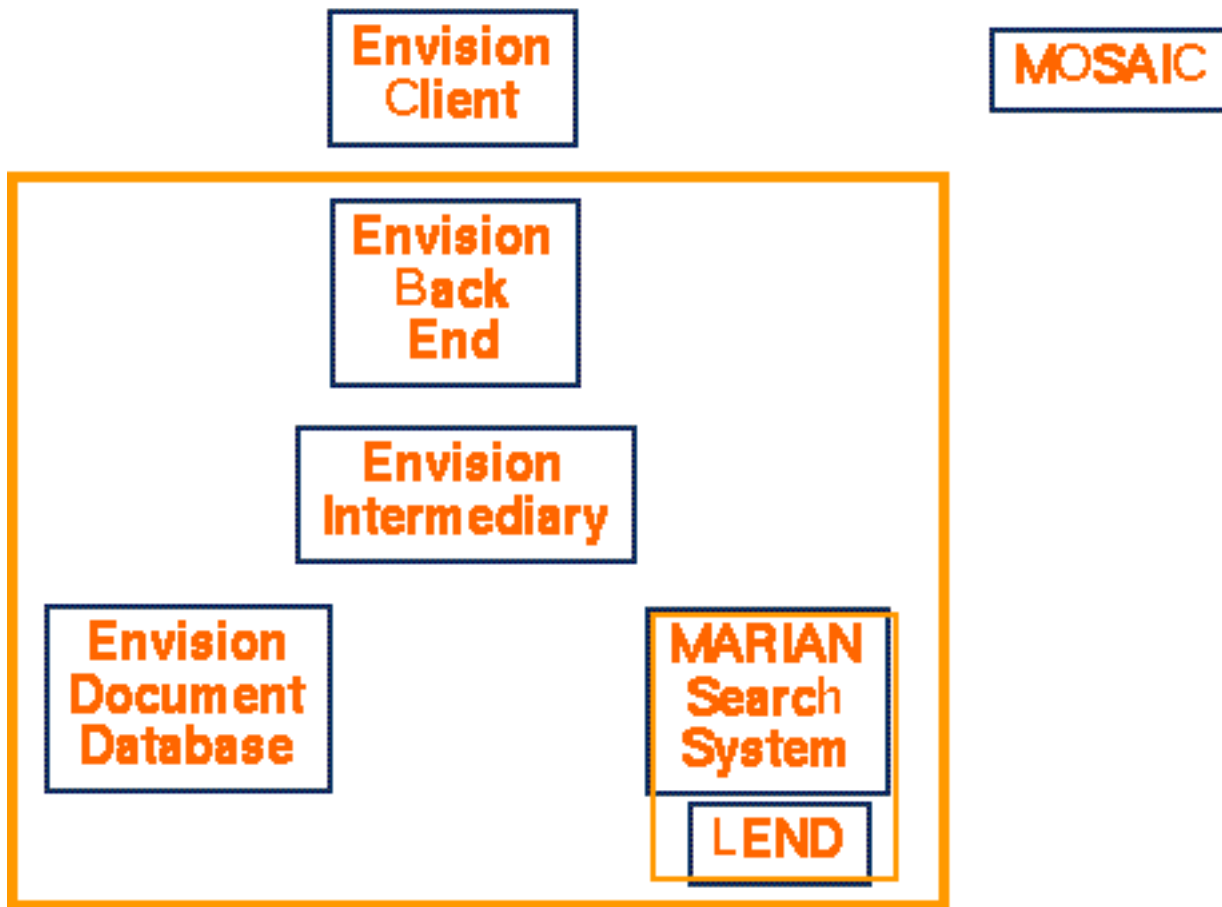
Efforts have concentrated on building an archive based upon SGML, developing an object-oriented database, applying the MARIAN retrieval system and WWW, and constructing a special search interface based upon user wishes.

The interface includes:

- [a query screen](#)
- [a results list screen](#)
- [a results visualization screen](#)
- Mosaic display of retrieved documents

The system architecture is a combination of various elements:

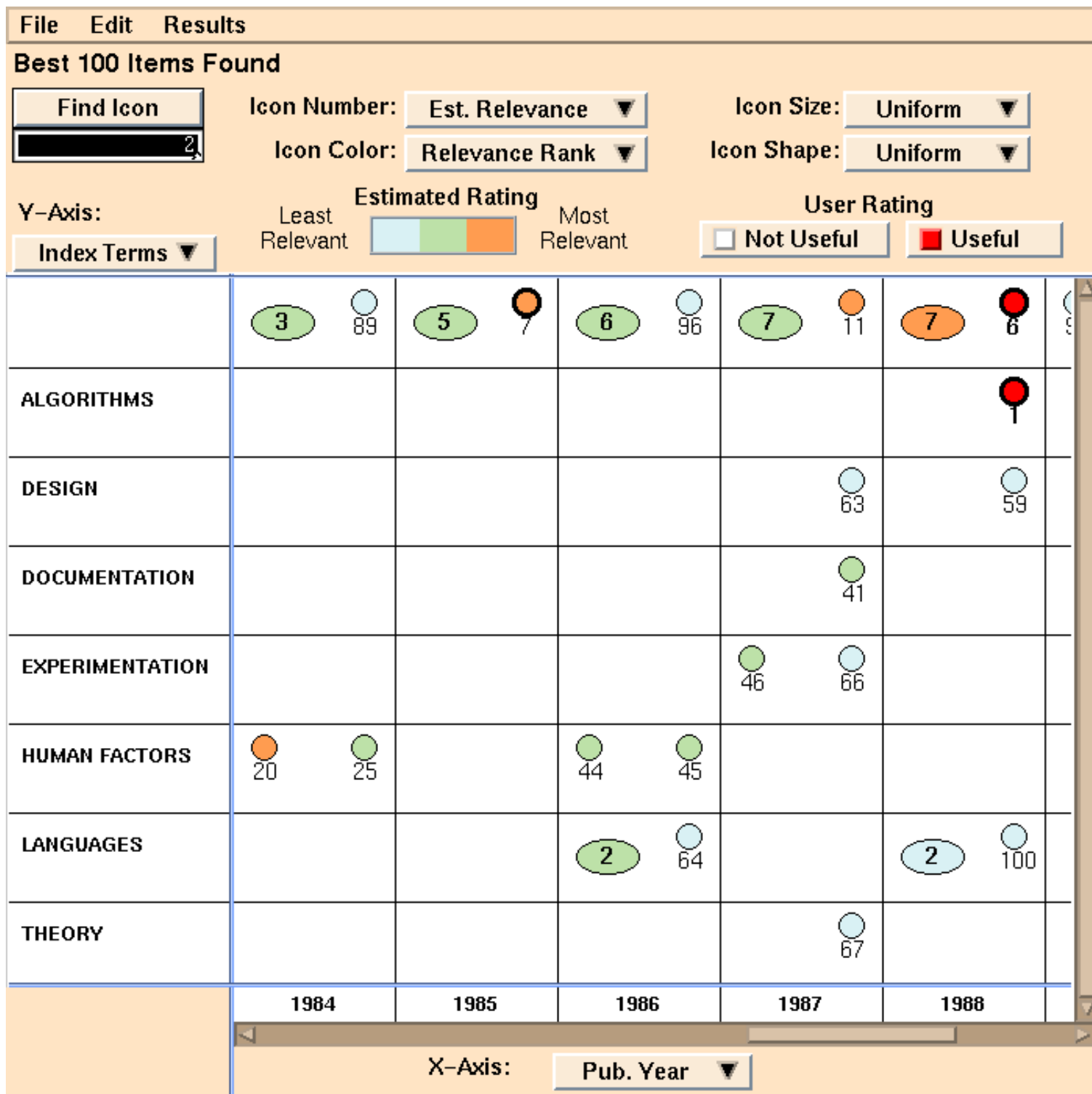
# Envision



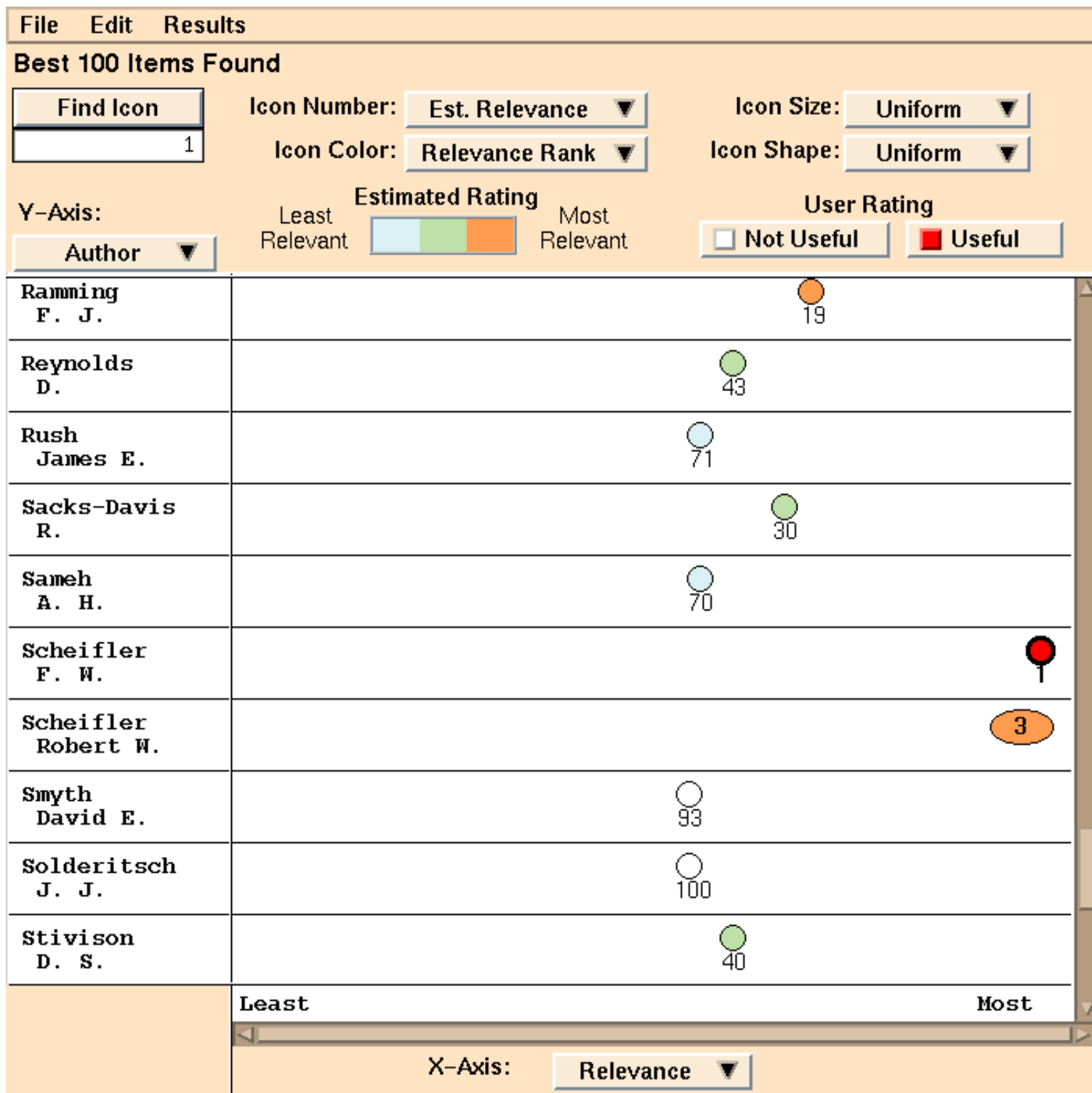
# Envision - Results Screens

The interface includes:

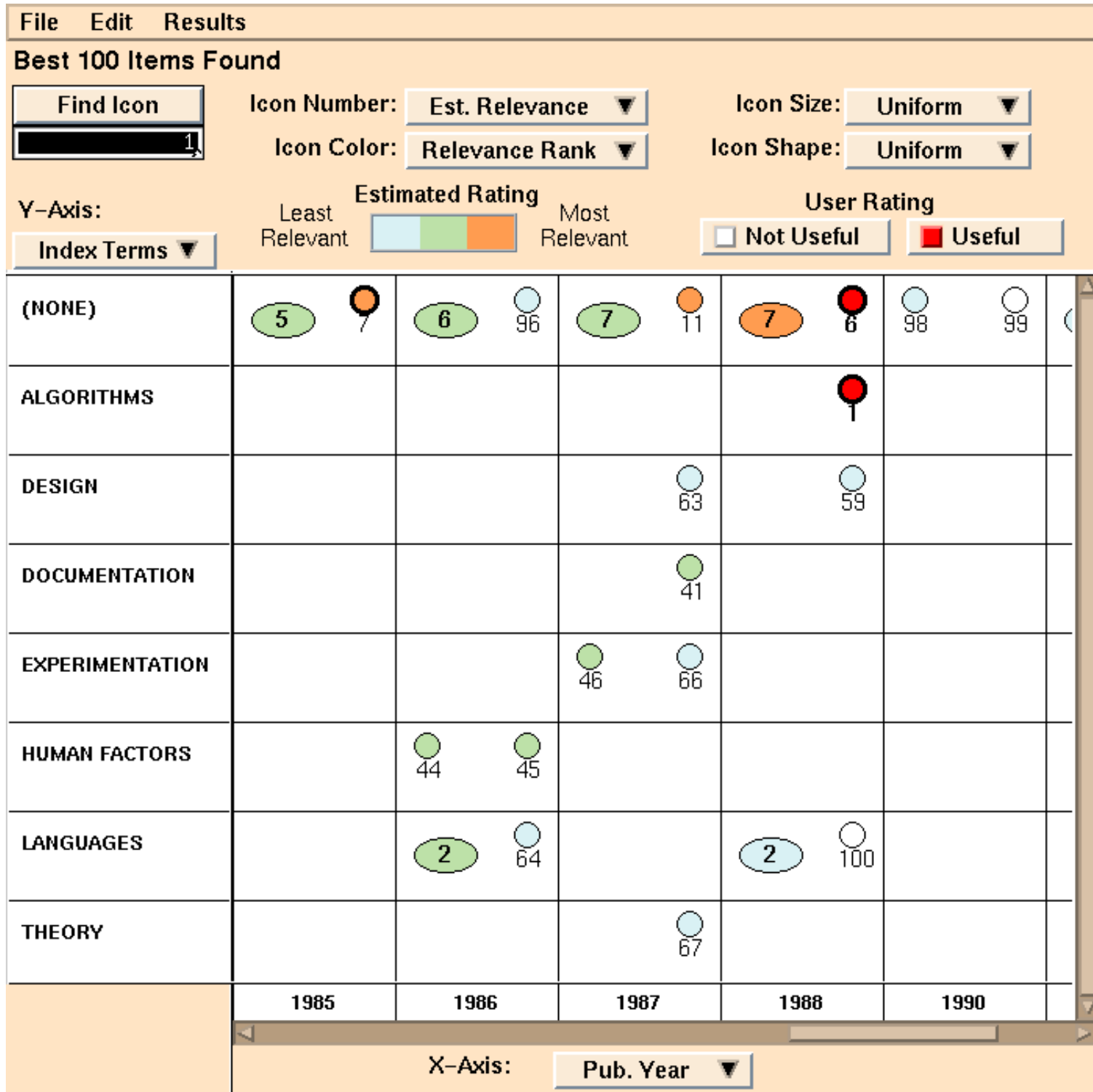
- Graphic View 1:



- Graphic View 2:



- Graphic View 3:



# Curriculum Resources in Interactive Multimedia

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## Curriculum Resources in Interactive Multimedia

### [Workshop at ACM Multimedia'99](#) [Workshop at ACM Multimedia'98](#) [About this project](#)

Curriculum Resources in Interactive Multimedia is a funded NSF project to support teaching and learning in computer science. Curriculum resources in interactive multimedia (CRIM) will be developed to help meet the chronic shortage for trained workers in the areas of interactive multimedia applications, education, interfaces, production, programming, publishing, systems, technologies, and tools. Curriculum guidelines and courseware will be made available through a digital library accessible through the WWW, linking back to resources developed at sites around the nation that will be a part of the CRIM Consortium.

Please submit or download information using the CRIM-related part of CSTC, the digital library of peer reviewed materials for computing:

- [CSTC \(digital library for Computer Science Teaching Center, including CRIM content\)](#)

We also encourage you to use or suggest changes or additions to our WWW resource pointer lists:

- [Contents of Resources Located on WWW](#)

Please also see more background on our project:

- [Project Proposal](#)
- [Change of Original Proposal](#)
- [Project Summary](#)
- Talk presented at ACM Multimedia'99. (You can read a [PDF version \(200K\)](#))

# Web Characterization Repository

## Search Repository

[Help](#)

Search :

## Browse Listing of Resources

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## Add New Resource

[Help](#)

Read the procedure on submitting resources and then ...

## Log File Formats

[Help](#)



# Digital Library Research Laboratory PetaPlex Research

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Beginning in 1999, the VT DLRL and Knowledge Systems, Inc. are pursuing a series of collaborations in use of the PetaPlex in Digital Library / Information Retrieval applications.

[KSI's home page on the collaborations](#)

This page documents the collaborations from the VT side.

The VT Digital Library Research Laboratory is researching several applications of the PetaPlex line of massive distributed storage devices developed by Knowledge Systems Inc. (KSI)[Akscyn, 1998 #246]. The platform currently installed at Virginia Tech is the VT-PetaPlex-1, a new 2.5 terabyte capacity system with 100 nodes (each with a 233 MHz Pentium processor running Linux and a 25 gigabyte disk). The PetaPlex can be used to store documents and other digital information objects in project archives. It can also be used to store the inverted files used by MARIAN searchers as by many other search engines. Current research is studying the problem of efficient storage and manipulation of very large inverted files in a parallel storage environment. Problems include distribution of data across the parallel storage units, support for the initial inversion process, and support for incremental update to inverted files. Each part will be evaluated using very large (20 gigabyte — 1 terabyte) collections of documents and queries, both live and synthesized.

— From the CONACyT grant proposal, Jan. 2000

Initial version of documentation for the PetaPlex API can be found at [ks.com/vt/50.html](http://ks.com/vt/50.html).

---

PetaPlex v. 1, with Rob Akcsyn, company president and information retrieval guru, in the Virginia Tech Computing Center.



# Netlib Repository at [UTK](#) and [ORNL](#)

Netlib is a collection of mathematical software, papers, and databases.

---

There have been [131,159,288](#) requests to this repository as of Fri Aug 24 09:05:04 EDT 2001 .

---

## Software, papers, etc.

- [Browse](#) the Netlib repository
- [Search](#) the Netlib repository

## Services provided at Netlib

- [Conferences Database](#)
- [Java Version of Linpack Benchmark](#)
- [Numerical Analysis Net \(NA-Net\)](#) and [NA Digest](#)
- [Performance Database Server](#)
- [Top500 Supercomputer Sites](#)

## Related efforts

- [BenchWeb](#)
- [HPC-Netlib](#), high performance branch of Netlib
- [Matrix Market](#)
- [National High-Performance Software Exchange \(NHSE\)](#)
- [Parallel Tools Library \(PTLIB\)](#)
- [Repository In a Box \(RIB\)](#)
- [StatCodes](#) at Penn State, statistical source codes and packages of use to physical scientists

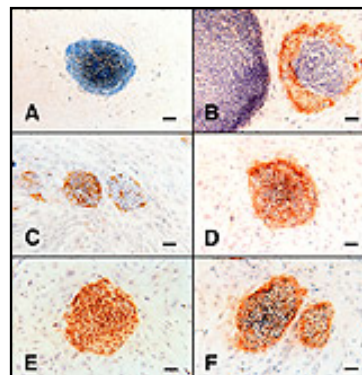


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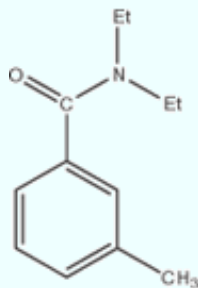
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- **August 26-30** [ACS Fall National Meeting](#) convenes in Chicago, IL.
- **August 31** Deadline for free employer job postings on [JobSpectrum.org](#).
- **September 2-7** The [British Association Festival of Science](#) takes place in Glasgow, United Kingdom.

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# Digital Libraries - Example: The CORE Project

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Some digital libraries have been developed for a profession. The CORE Project is such an effort, for the field of chemistry. It involves the major US publisher and information provider of chemistry information, the American Chemical Society, and its subsidiary, Chemical Abstracts Service.

Statistics regarding CORE Digital Library:

- Pages: 430K (now 375K)
- Extracted Graphics: 387K
- Articles: 82K
- Gbytes Page Images: 50
- Gbytes Text: 4.4
- Gbytes Graphics: 6
- Gbytes Index: 11
- Scanning from: paper, microfilm
- High Resolution (to print): 300dpi (2560x3328) B&W
- Low Resolution (to display): 100dpi (856x1109) grey scale
- Conversion of Figures: extraction
- Conversion of Text: typesetter tapes to SGML
- search engine: OCLC's Newton
- Interfaces: OCLC's SCEPTER, Bellcore's Pixlook

D-Lib Magazine, December 1995

## Project Briefings and Updates

---

# Making a Digital Library

*The Chemistry Online Retrieval Experiment  
A Summary of the CORE Project (1991-1995)  
December 1995*

### Contributed by:

Richard Entlich, Cornell University

Lorrin Garson, American Chemical Society <http://pubs.acs.org>

Michael Lesk, Bellcore <http://community.bellcore.com/lesk/home-page.html>

Lorraine Normore, Chemical Abstracts Service

Jan Olsen, Cornell University

Stuart Weibel, OCLC <http://www.oclc.org:5046/~weibel>

The CORE project was an electronic library prototype of primary journal articles in chemistry, containing about four years of twenty primary journals published by the American Chemical Society (about 400,000 pages). CORE included both scanned images and an SGML (Standard Generalized Markup Language) marked-up version for on-the-fly rendering for screen display. Each page was scanned and segmented, with graphical units isolated and linked to figure references in the articles. The original machine-readable typography was converted to SGML format and the results were used to build databases with indexes for full-text Boolean searching.

Each page image was stored as a 300 dpi bitonal image for printing, and 100 dpi greyscale for screen display. All text data and the most recent page images were available on Unix-based magnetic storage at any given time, with additional (older) page images stored on a WORM (Write Once, Read Many) jukebox.

Complex scientific material (superscripts, tables, equations, special fonts and symbols, etc.) presents substantial problems for representation and display, especially when the material is being converted from previously published information, as were these journals.

# The Design and Implementation of XSCEPTER, an X-Windows Graphical User Interface to the CORE Project

**Principal Investigator:** Stuart L. Weibel, Consulting Research Scientist

---

## Abstract

The CORE project is an electronic library prototype that provides networked access to the full text and graphics content of American Chemical Society journals and associated Chemical Abstracts Service indexing since 1991. This project provides a full scale laboratory environment in which to explore issues of database structure, user interface capabilities, and information retrieval questions on a large, real-world scholarly electronic journal database. The magnitude of the CORE project, along with the complexities of searching and navigating large full-text collections require novel capabilities in user interface design. This report discusses key design issues and the capabilities of OCLC's XSCEPTER interface to the CORE database. It describes strategies for providing cross-platform interoperability, searching and browsing capabilities, and the formatting and display of complex SGML data.

---

CORE, a collaborative electronic library project hosted by Cornell's Mann Library, provides electronic access to all American Chemical Society Journals (with associated Chemical Abstracts Services indexing) dating back to 1991. The complete database, representing about 450,000 pages of full text and graphics, will be the largest electronic corpus of its kind. Cornell's Mann Library, Bell Communication Research (Bellcore), the American Chemical Society, Chemical Abstracts Service, and OCLC are working together on this effort.

The full-text component is encoded in Standard Generalized Markup Language (SGML) translated from the original typesetting files for the American Chemical Society's journals. Individual figures and graphics are extracted algorithmically from scanned page images and corresponding tagged indicators are inserted to reflect the location of the images. The scanned full-page images are stored in two resolutions and thus are available for both printing and screen display.

The magnitude of the CORE project, along with the complexities of searching and navigating full text and images of differing journals, requires a user interface with novel and robust capabilities. This report discusses OCLC's XSCEPTER (X-windows SCientific Electronic Publishing and TExt Retrieval) interface to the CORE database.



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In so doing, it provides online and fully integrated access to a deep archive of historical literature from Elsevier Science journals within specific disciplines, in some cases covering more than 100 years of scientific research. Full text access will be made available in clusters.

The first cluster: [Organic Chemistry journals](#) - provides electronic coverage of over half a million pages. The second cluster: [Inorganic Chemistry titles](#) has just been released, and plans are underway for a third suite of prestigious journals in the field of Chemical Engineering. For further details, see the current issue of [ScienceDirect Connect](#).

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## DB2 Digital Library

### DB2 Digital Library

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Tomorrow's digital asset management system is here today and, you can be part of it. Whether it's video, audio, images, or text, IBM DB2 Digital Library transforms multimedia assets into digital form which can be distributed over public or private networks.

And now DB2 Digital Library is part of the new [IBM Content Manager](#) solution which manages not only multimedia assets, but **all** your digital information – scanned images, workgroup business documents, computer generated reports, Web content management (XML/HTML) and more.



### Spotlight

#### Features at a glance

Whether it's video, audio, images, or text, IBM DB2 Digital Library transforms multimedia assets into digital form which can be distributed over public or private networks -- like the Internet and your corporate intranets -- to users around the world. And now this technology is also part of [IBM Content Manager](#) which combines the information management capabilities of DB2 Digital Library and IBM EDMSuite for a truly comprehensive solution.

There are [real implementations](#) of IBM DB2 Digital Library that serve the needs of archivists, film/video production groups, educators and researchers medical technologists, advertising and creative agencies, multimedia, print and Web publishers and marketing communications departments. These applications allow you to manage your analog and digital media assets centrally. Through these efforts such benefits can be brought to you...*fast*.

We invite you to take a look at [IBM DB2 Digital Library](#): the product, the architecture and industry solutions. You'll see why IBM DB2 Digital Library is revolutionizing the way you'll do business with your multimedia assets.

IBM DB2 Digital Library is available for the AIX and Windows NT operating systems. Client support includes Windows 95 or 98, Windows NT, AIX, and Macintosh.



[DB2 Digital Library becomes part of IBM Content Manager](#)

#### Operating systems

DB2 Digital Library runs on **AIX, Mac OS, Windows 95 & Windows 98 and Windows NT.**

#### More resources

#### News

[an error occurred while processing this directive] [an error occurred while processing this directive] [IBM](#) : [Software](#) : [Data Management](#) : [IBM DB2 Digital Library](#) : [an error occurred while processing this directive]

## IBM DB2 Digital Library Version 2



*An end-to-end solution for managing multimedia content.*



- Reach new markets and establish new sources of revenue through improved management and reuse of media assets
- Preserve your assets from physical deterioration
- Protect your assets with advanced rights management
- Consolidate management of text, images, audio and video with easier, faster access
- Save money with electronic delivery
- Be ready for Year 2000

Developed with a variety of key customers and business partners, IBM DB2 Digital Library has helped businesses and institutions in the areas of higher education, media and publishing, entertainment, culture, health, and commerce provide greater access to their digital assets, while enhancing their growth and new revenue opportunities. IBM Digital Library Version 2, building on the strength of these technologies, enables literally petabytes of text, images, audio and video, to be created or transformed into digital form and distributed over any network, with security, to users around the world.

### **New features in Version 2 include:**

- Enhanced platform support now includes Windows NT and Macintosh
- Multi-language development tools
- Enhanced rights management
- Integrated multi-search capability
- Integrated support for IBM media servers
- Java-based system administration interface
- Easier installation with graphical user interface guides
- IBM DB2 Universal Database components

[Key Features of IBM DB2 Digital Library Version 2](#)

[IBM DB2 Digital Library Architecture](#)

[IBM DB2 Digital Library at a Glance](#)

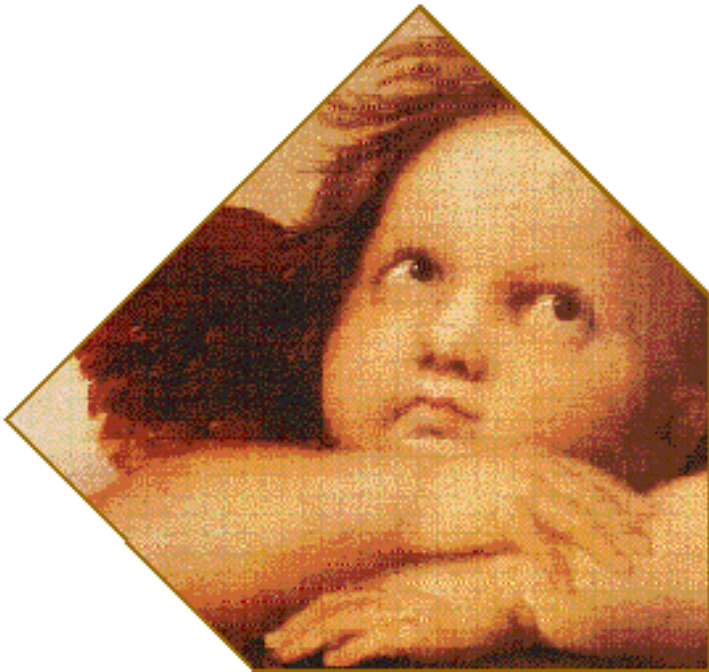
[an error occurred while processing this directive] [an error occurred while processing this directive] [IBM](#)  
: [Software](#) : [Data Management](#) : [IBM DB2 Digital Library](#) : [an error occurred while processing this  
directive]

## IBM DB2 Digital Library Collection Treasury



### Extending worldwide access to special collections

Museums and libraries holding special, unique collections have two distinct missions. On the one hand, these institutions want to share their collections with as many people as possible. On the other hand, as copyright holders or caretakers for irreplaceable cultural artifacts, they want to minimize exposure to their holdings, in order to ensure their preservation.



Working with museums and libraries, IBM has developed IBM DB2 Digital Library(TM) Collection Treasury--a solution that will enable these institutions to maximize their ability to share their holdings, while substantially reducing risks to preservation. The solution, based on IBM DB2 Digital Library technology, enables institutions to provide worldwide access to their holdings via the Internet and vastly increase the potential "visitor traffic" to the institution. At the same time, none of these visitors ever touch the holdings, reducing risk of damage, loss and theft.

In effect, IBM DB2 Digital Library Collection Treasury extends the walls of the traditional library or museum, making possible "virtual libraries" and "virtual museums" that can be explored at any time, from anywhere in the world. Sophisticated search technology enables the "virtual visitor" to sort

through vast collections with ease, finding a specific document or image among thousands. This powerful search and access capability also enables the visitor to conduct lengthy ongoing research conveniently from a distance, integrating this research into a normal daily schedule.

By contrast, consider the traditional situation. Many university researchers are a plane ride away from any specific museum or library. If they wish to conduct research involving documents or images at a given institution, finding travel funds is often difficult. If they find the funds, they need to set aside at least two days to travel to and from the site, and then need to compress their research time into an arbitrary block of time reserved for the research. If they have follow-up questions, another trip must be scheduled--or the research questions go unanswered.

Now, IBM DB2 Digital Library Collection Treasury offers the potential to transform museums and libraries for the digital age, making their unique collections more relevant to more people than ever before. Thanks to IBM's rights management and watermarking technologies, institutions will continue to exercise tremendous control over their collections--minimizing illegal copying, and restricting access to any specific audience. What has changed is the breadth of access: with the tyranny of distance removed, libraries and museums can truly "serve the world."



© IBM Corporation

**QBIC™**

## QBIC(™) -- IBM's Query By Image Content

On-line collections of images are growing larger and more common, and tools are needed to efficiently manage, organize, and navigate through them. We have developed the QBIC system which lets you make queries of large image databases based on visual image content -- properties such as color percentages, color layout, and textures occurring in the images. Such queries use the visual properties of images, so you can match colors, textures and their positions without describing them in words. Content based queries are often combined with text and keyword predicates to get powerful retrieval methods for image and multimedia databases.

Check out QBIC's availability in the [DB2 Image Extenders](#), which are components of IBM's scalable, multimedia, Web-enabled [DB2 Universal Database](#). Other related sites include

- The [Hermitage Web site](#) was recently voted the best in Russia. It uses the QBIC engine for searching archives of world-famous art.
- Please check our new [CueVideo](#) project which provides technologies to automatically summarize and index videos and to make them much easier to browse.
- [IBM Digital Library - Related technologies for information management.](#)
- [Technical paper requests on QBIC \(please provide surface mailing address in your request.\)](#)

To run a demo of the original QBIC system see the links below.

- [A collection of all U.S. stamps before 1995, searchable by QBIC and DB2 with a Java GUI.](#)
- [A prototype trademark browsing and retrieval site.](#)

---

[ [IBM home page](#) | [Order](#) | [Search](#) | [Contact IBM](#) | [Help](#) | [\(C\)](#) | [\(TM\)](#) ]

## IBM Digital Library

### Media & Entertainment Solutions



# News Archive Solution

***A solution for news asset management  
--spanning text, photos, graphics, transcripts, film, video and audio***

Imagine if retail stores took their cash income at the end of each day, stuffed it in a mattress, and forgot about it forever.

That may sound ludicrous. But without good management, it's essentially what happens in broadcast news when video assets aren't managed as valuable cash assets.



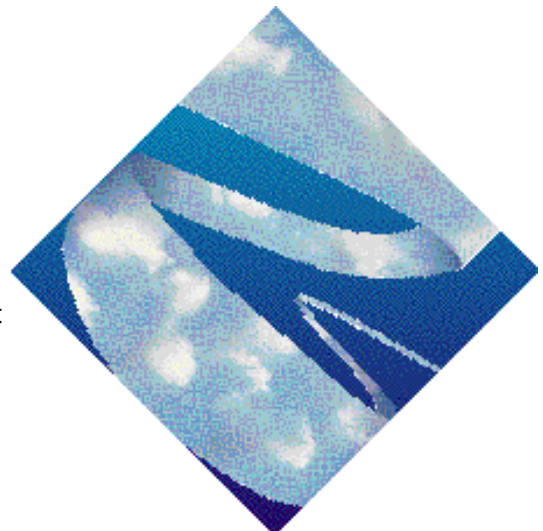
Broadcast news operations work hard every day, and spend a great deal of money, to capture the best video content possible for current news stories. Much less attention is spent on managing and reusing this content after the fact. Since video content is essentially the cash commodity of the business, that's like stuffing wads of hundred dollar bills in a mattress.

Do the math. The average finished minute of broadcast news costs the industry thousands of dollars to produce. However, once produced, that finished minute can be reused and resold again and again. It's like selling lemonade, and then putting the lemonade back in the bottle to sell again.

Often, it's more than just an economic issue. News, by definition, involves the reporting of "new" events, requiring an instant and professional response to an unpredictable world. When a major leader is overthrown in a coup, you want footage of that leader now. When two sports teams engage in a blockbuster trade, you want highlight footage of the traded players now.

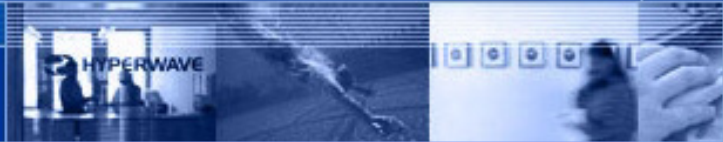
The IBM News Archive Solution makes such responsiveness easily possible, helping you to break news faster, beat the competition with higher quality news stories, and end the day with more cash in your pocket than in the proverbial mattress.

Designed specifically to serve the needs of a major TV network, the IBM News Archive Solution is robust enough to support any broadcast news operation in existence today. A complete solution, it packages application software, systems software, implementation services and support. The packaged solution means that you don't have to be a multimedia database expert yourself to integrate powerful database management into your news operation. With IBM's help, you can be up and running quickly.





Boston · Geneve · Graz · Hamburg · München · London · Paris



English

Deutsch

See also

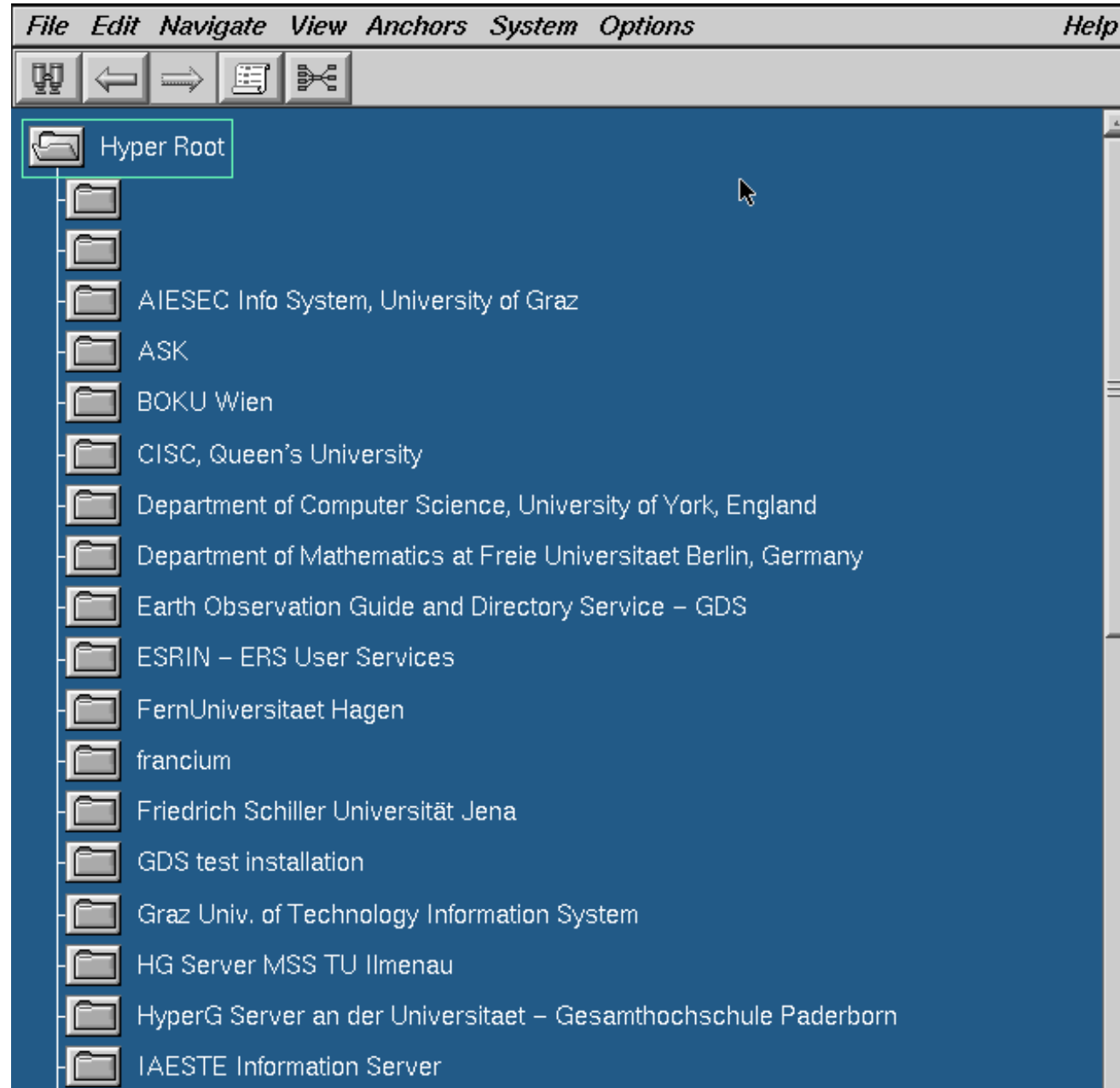
**TRACKS. [HYPERWAVE.COM](http://www.hyperwave.com)**

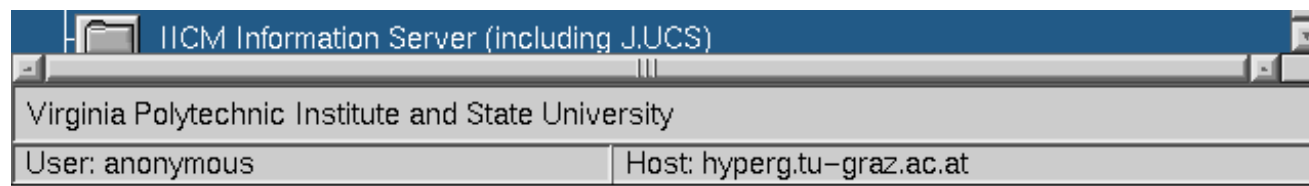
the official source for Hyperwave  
Information Portal tracks

# Hyper-G --- Harmony Illustrations

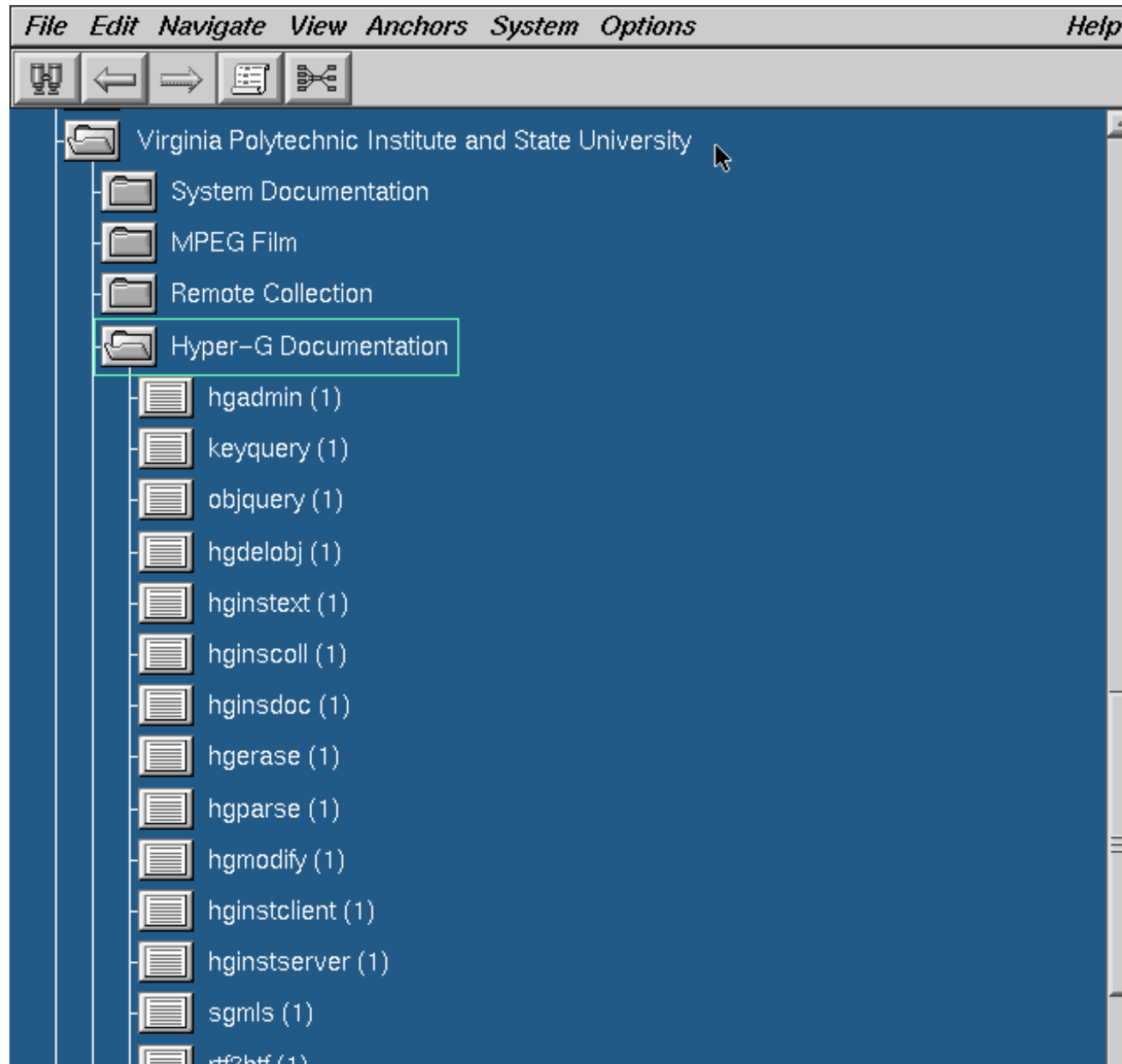
Illustrations of the use of Hyper-G with the Harmony (UNIX) client include:

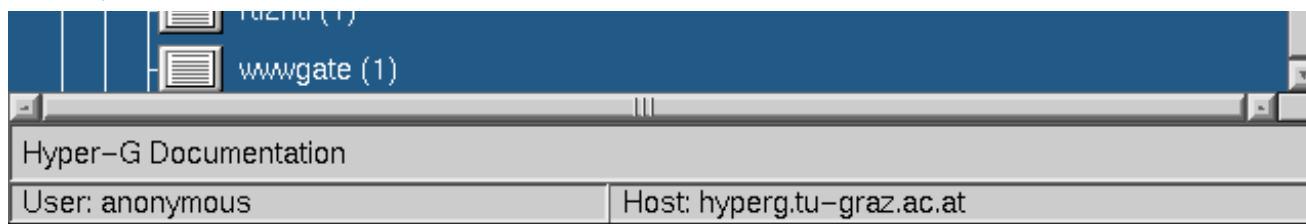
- connection to the global root



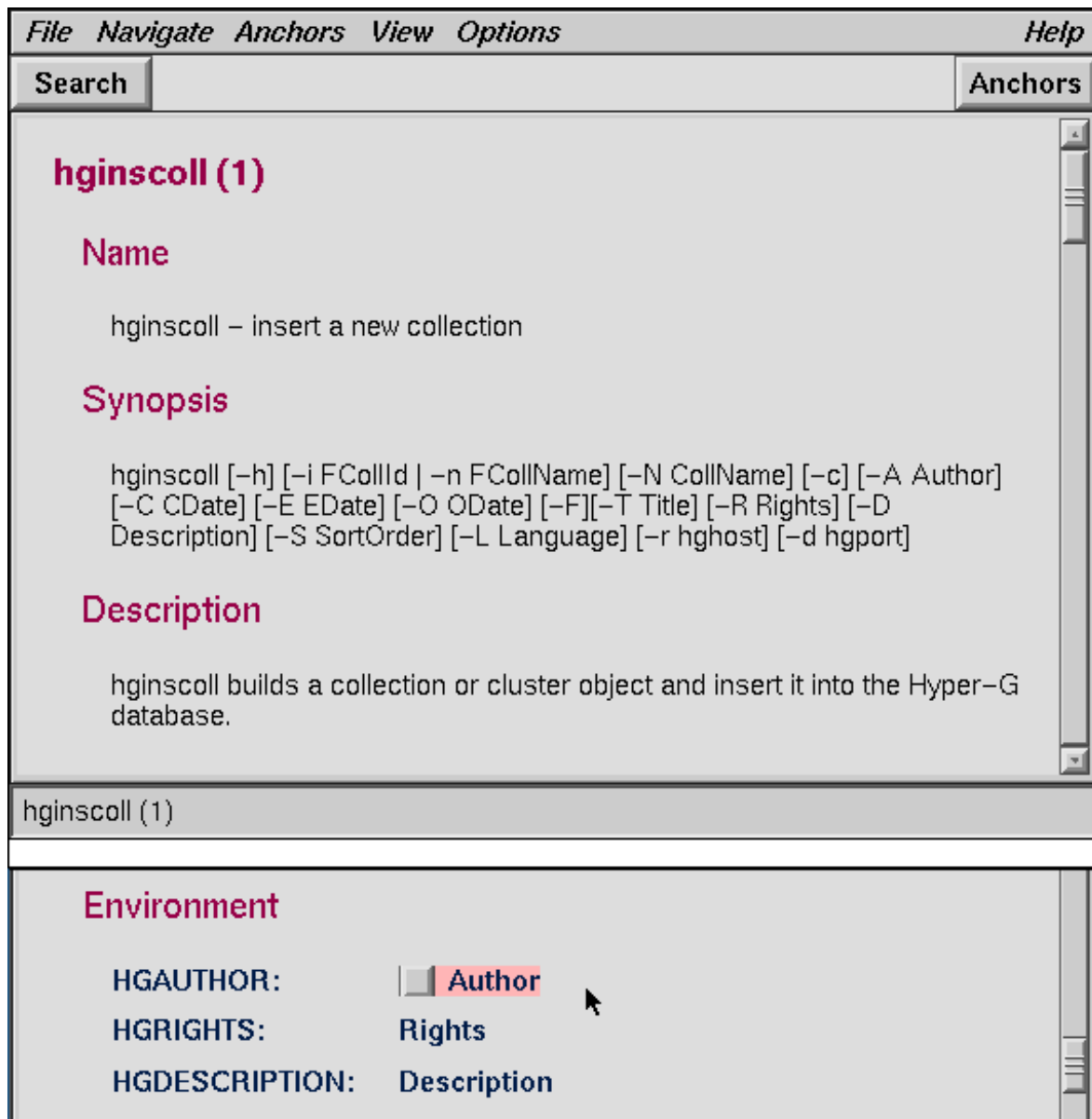


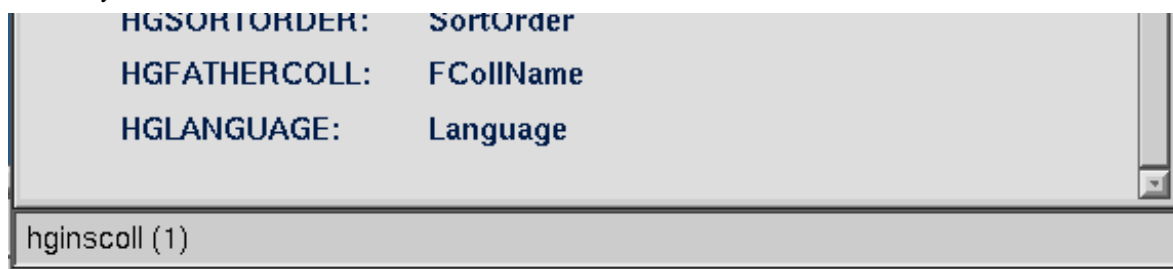
- expansion of the collection of nodes accessible from the root to those at the Virginia Tech server



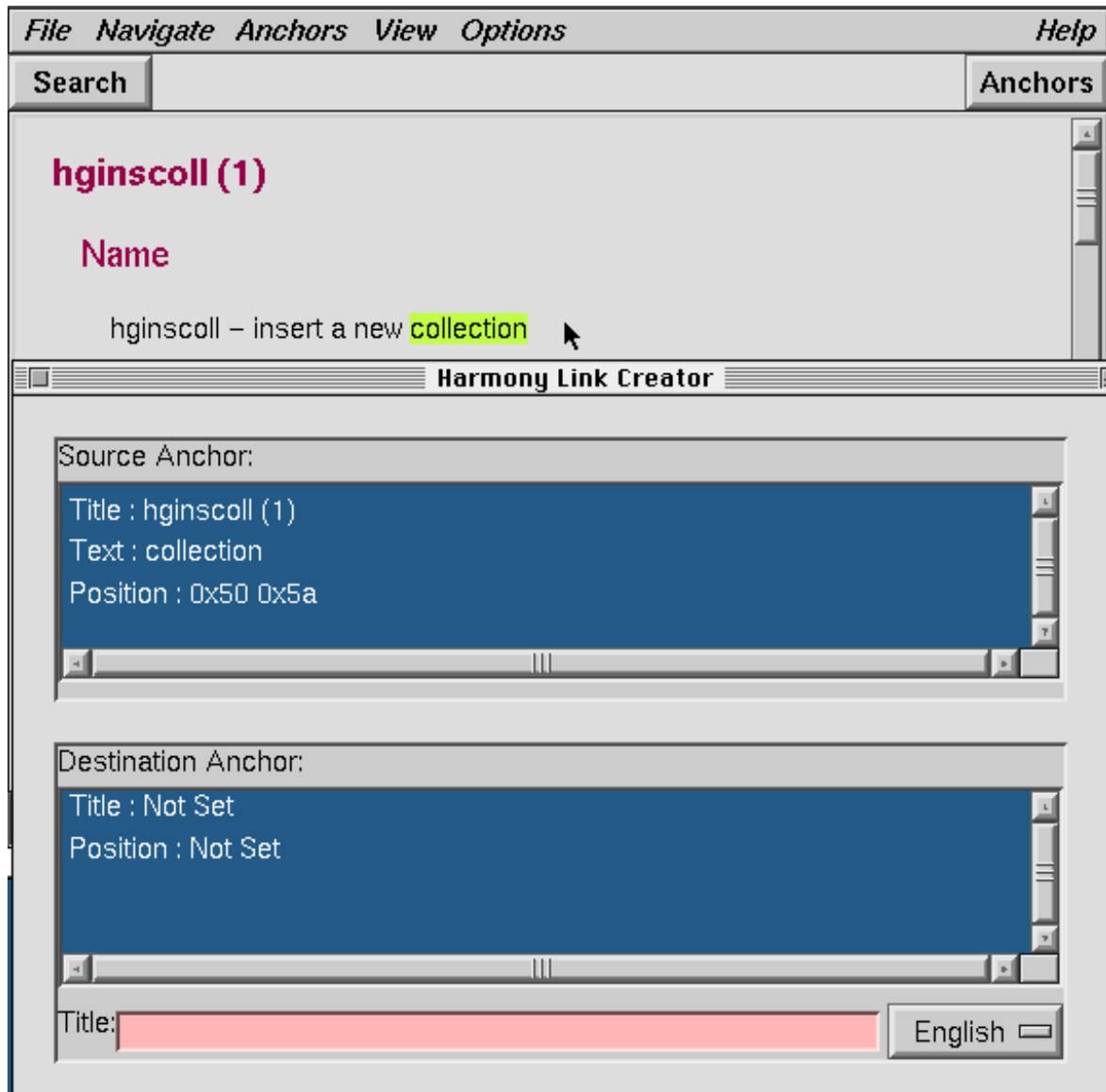


- viewing two text nodes and marking an anchor





- making a link

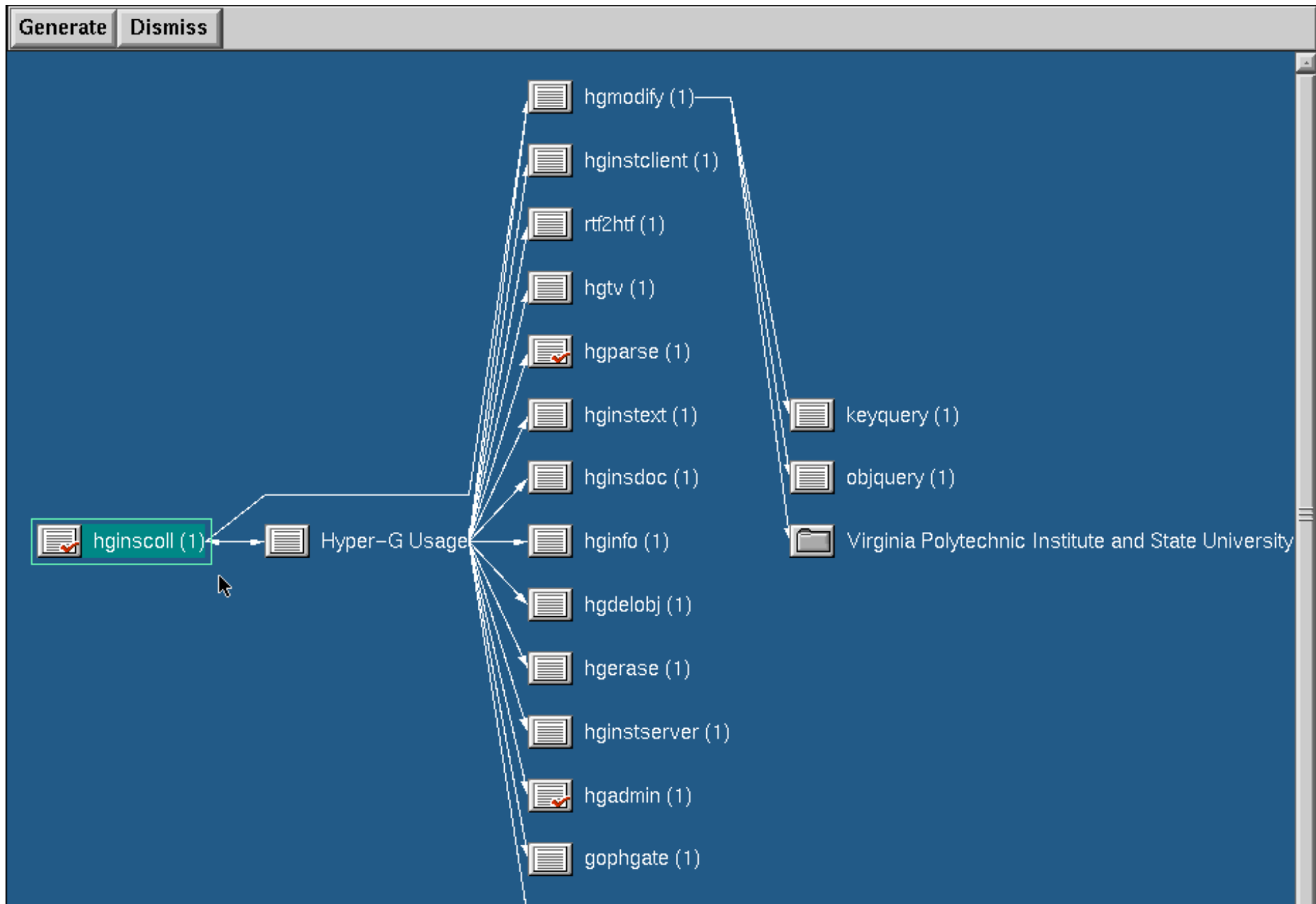


Create Link

Cancel

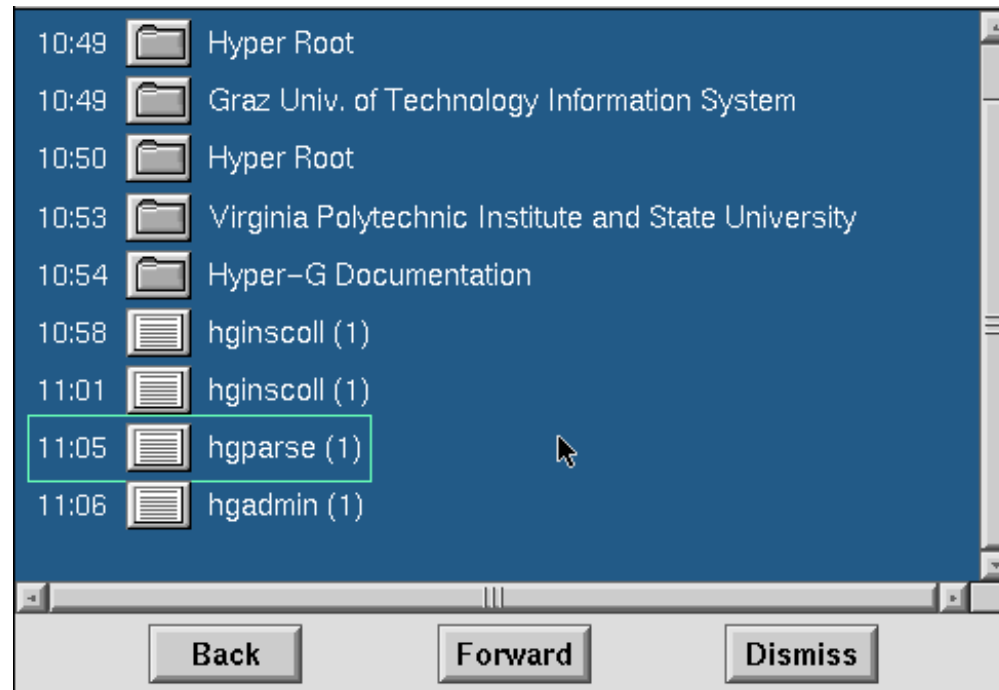
Help

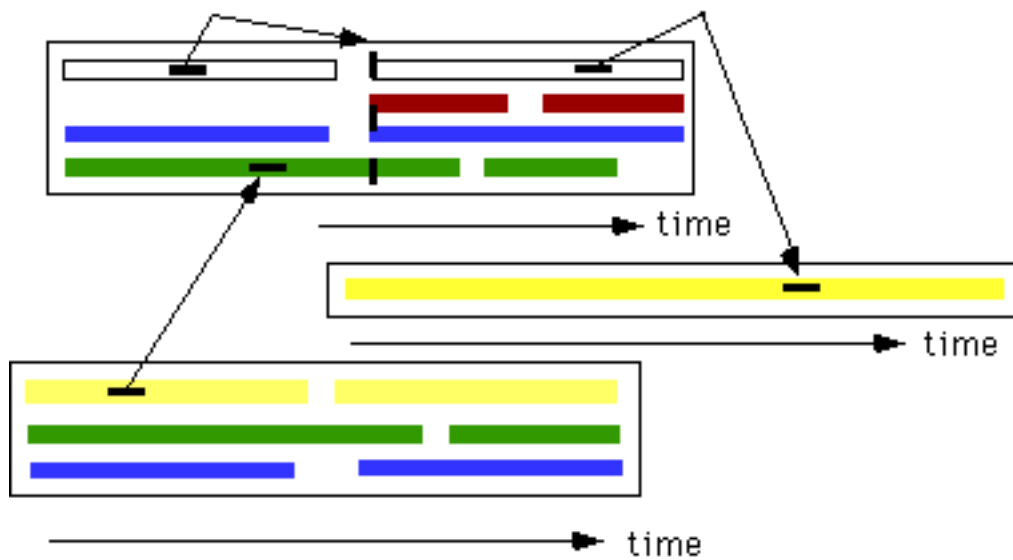
- viewing a local map





- reviewing the history of accesses





## HYPERMEDIA COMPOSITES

[Adapted from HARD94 p. 53, Fig. 1c]

# Models: Amsterdam - hypermedia

- Each of the 3 boxes represents a component or node that includes multimedia (time-based) information.
- When a component is presented, it *plays* for a period of time.
- The middle component is atomic, having only one media type. The black marker 2/3 of the way along is an anchor, which would allow one to *jump* directly to that point (in time / play).
- The other two components are composites, with several streams of multimedia information. The bottom one has three streams and six components, where components shown with the same color are played-back in sequence.
- The bottom component has one *from* anchor to a span in the first green-stream child-component of the top composite component.
- The top component is the most complex. About half-way through is a synchronization point, so one can jump there and all the streams will start then, at the same time. That point is reached from an anchor in the first white component. Other anchors point outside or are pointed to from outside.



# BLACKSBURG

## electronic village



### Community

Arts

Organizations

Religion

Sports

### Education

Library

Museums

Schools

### People

Discussion

Seniors

### Government

### Health

### Village Mall

### Visitor's Center

### Search Tools

### Help Desk

### Full Index

## Calendar

### Fridays at the Park

Virginia Tech's Corporate Research Center's Chat Room Cafe sponsors this concert series each Friday evening from 5:00 to 8:00 pm. The small hill outside the cafe offers a natural amphitheater setting where blankets and lounge chairs compliment the outdoor venue. The featured entertainment for Friday (8/24) will be "Charlie & Justin Accoustic Summertime Tour". Come enjoy the entertainment and the delicious food with other CRC employees.

### YMCA Open University Fall 1 Registration

YMCA Open University Fall 1 class schedule will be available on August 28th and class registrations will begin September 3. Class start the week of September 10th and last for 6 weeks. Over 80 classes covering a wide range of subjects will be offered. Please call 231-4208 or visit our [website](#) for more information.

### Breastfeeding Study

Nutrition Researchers at Virginia Tech are recruiting pregnant or

### Blacksburg Regional Chamber of Commerce & Christiansburg-Montgomery Chamber to vote

The vote by members of the Blacksburg Regional Chamber of Commerce and the Christiansburg-Montgomery Chamber on consolidating the two organizations has been scheduled for September 27th. Two question and answer sessions will be scheduled between now and 9/27, one for Christiansburg and one for Blacksburg.

### An Evening of Classical India Music

The music of India is the distilled essence of a tradition steeped in antiquity and sophistication. [AID](#) Blacksburg, a non-profit, voluntary organization, presents an evening of Indian music, featuring reknown Indian flutist, Ms. Jayaprada Ramamurthy, and our very own Lisa Likse-Doorandis, on the cello and Darisuh Liske-Doorandish, on the sitar and the guitar. Join us Sunday (8/26) beginning at 7:00 pm in the Recital Salon, Squires Student Center at Virginia Tech. Tickets are available at the



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Welcome to the **BEV HistoryBase**, a WWW History Page for the [Blacksburg Electronic Village!](#) Try out the [BEV History Timeline](#) to learn more about the history of our electronic community. For a non-graphical alternative, check out the [Textual BEV History Timeline](#). Both contain the same information so feel free to browse either.



[ [Main Timeline](#) | [Contribute](#) | [What's New?](#) | [Search](#) ]

## [Message of the Day Listings](#)

## [Blacksburg Telecommunications Advisory Committee Meeting Minutes](#)

## [BEV Media Coverage Archive](#)

## [BEV Group Home Pages](#)

This project is supported by NSF Grant CDA-9424506. A [copy of the grant proposal is online](#).

---

Last updated 27 October 1995 / [schmidt@cs.vt.edu](mailto:schmidt@cs.vt.edu)

**Quick-Click  
Timeline**

1	9	9	2	1	9	9	3	1	9	9	4	1	9	9	5	1	9	9	6	1	9	9	7
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

# BEV HistoryBase: Jan-Mar, 1992

- January 18 1992 [Plan would change fiber of Blacksburg](#)
- January 21 1992 [Blacksburg: Model of computer future](#)
- January 21 1992 [Blacksburg may become 'electronic village'](#)
- January 21 1992 [Hi-tech may be the norm](#)
- January 21 1992 [Fiber optics may link Blacksburg](#)
- January 21 1992 [A look into the future](#)
- January 21 1992 [Project envisions Blacksburg as an 'electronic village'](#)
- January 27 1992 [Virginia Tech Launches Study for Fiber Optic Community Network](#)
- January 30 1992 [Electronic village proposed](#)
- January 31 1992 [Gut \(Comic Strip\)](#)
- February 1992 [Electronic Village: Technology showcase](#)
- February 06 1992 [Blacksburg Telecommunications Advisory Committee Minutes](#)
- February 11 1992 [Electronic village could make us lazy](#)
- February 13 1992 [In a Small Mountain Town, The 21st Century Is Calling](#)
- February 25 1992 [The Blacksburg Experiment](#)
- March 03 1992 [Blacksburg Telecommunications Advisory Committee Minutes](#)

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# TITLE: A look into the future

**Contributor:** KENNETH WILLIAM SCHMIDT JR ([wschmidt@bev.net](mailto:wschmidt@bev.net))

**Submit Date:** Aug 23 1995

**Document Date:** January 21 1992

**Document Categories:** Media Coverage: Newspaper

**Author:**Cathryn McCue and Madelyn Rosenberg

**Publication:***New River Current*

**Summary:** This article talks about the BEV project, why Blacksburg is a good place for such an experiment, and has quotes from interviews with key project personnel.

[Add an annotation to this document](#)

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## VTETD COLLECTION

ETD-db: Log In

---

Enter your Virginia Tech PID (username) and password. Note that you must use the PID you were originally assigned, and not any aliases you may have created. [Help with PIDs](#) (including forgotten passwords or deactivated accounts).

**Username:**

**Password:**

Your browser must accept [cookies](#) to continue the submission process. ([browser compatibility issues](#)).

**Please note:** If you are using Internet Explorer, and the clock on your machine is more than 15 minutes out of sync with the clock on our server, you may have problems with the cookies used by the submission software. The current date and time on our server is **Sat Aug 25 05:37:48 EDT 2001** . Be sure to reload this page before attempting to reset your clock.

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Having problems? [Get help using the submission process.](#)

If you have more questions or technical problems, please [Contact SCP](#).

# People:

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[Rob Akscyn](#) of [Knowledge Systems Incorporated](#) with its [PetaPlex Project](#)

[Caroline Arms](#) of [Library of Congress](#)

[William Arms](#), at [Cornell CS](#), formerly at [CNRI](#)

[Dan Atkins](#) [University of Michigan, DLI-1 Digital Library Project](#) Director.

[Howard Besser](#) of [School of Information Management and Systems at Berkeley](#)

[Bill Birmingham](#): [University of Michigan, DLI-1 Digital Library Project](#) Researcher.

[Chris Borgman](#) of [Information Studies at UCLA](#)

[Hsinchun Chen](#) Head of the [AI Lab of U. Arizona](#) and director of new [DLI-2 project](#)

[Stephan Fischer](#) - working on multimedia and metadata

[Edward A. Fox](#) Director of the [Digital Libraries Research Group](#) at Virginia Tech.

[Beverlee French](#), University Librarian and Executive Director, Interim [California Digital Library](#).

[Rick Furuta](#) of [CS at Texas A&M Univ.](#)

[Hector Garcia-Molina](#) in the [Stanford DB Group](#)

[Henry Gladney](#) retired from [IBM Almaden Research Laboratory](#)

[Dan Greenstein](#), Director of the [Digital Library Federation](#)

[Stephen Griffin](#), Program Director of the [Digital Libraries Initiative](#), in [NSF' IIS program](#)

[Robert Kahn](#) of [CNRI](#)

[Judith Klavans](#) of [Digital Libraries Projects at Columbia](#)

[Carl Lagoze](#) of [DL Research Group](#) of [CS at Cornell Univ.](#)

[John Leggett](#) of [CS at Texas A&M Univ.](#)

[Michael Lesk](#) Director of [NSF' IIS program](#) that runs the [Digital Libraries Initiative](#)

- [Images: Quantity is not always Quality - U. KY talk](#)
- [digital libraries](#)
- [library preservation](#)
- [information retrieval](#)
- [networking, etc.](#)
- [Projections for Making Money on the Web](#)

[Richard Lucier](#), College Librarian, Dartmouth. See his D-Lib [article on CDL](#)

[Clifford Lynch](#) Director of [CNI](#)

[Gary Marchionini](#)

- Previously at [U. Md.](#)  
with its [DL Home Page](#)
- Now at [U. NC Chapel Hill School of Information and Library Science](#)
- [Encyclopedia article draft](#)
- [CACM April 1995 article](#)

[Michael Mauldin](#) ([home page](#), [Lycos](#), [CMU School of Computer Science](#))

[Bruce Schatz](#) Principal Investigator of [University of Illinois at Urbana-Champaign, DLI Project](#)

[Robin Sewell](#), co-PI with Hsinchun Chen (see above) on U. of Arizona DLI-2 project

[Marvin Sirbu](#) of [CMU Engineering and Public Policy](#)

- [publications available online](#)

[Terry Smith](#) from [Geography](#), Director of [Alexandria project](#) at [U. CA Santa Barbara](#)

[Howard D. Wactlar](#), Principal Investigator of the [Informedia Digital Video Library](#), [CMU School of CS](#)

Donald Waters of [The Andrew W. Mellon Foundation](#)

[Stuart Weibel](#) of [OCLC Office of Research](#)

[Robert Wilensky](#) Principal Investigator of [Berkeley DLI Project](#)

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Note: for an extensive list of people involved in digital libraries, see the [Author Index](#) of D-Lib Magazine.

Note: for a list of some of the key people in the digital libraries field, see the report on this from a Delphi Study at [http://www.coe.missouri.edu/~is334/projects/Delphi\\_DL/StatementAnalysis.htm](http://www.coe.missouri.edu/~is334/projects/Delphi_DL/StatementAnalysis.htm): "By consensus, those identified in the rounds of the Delphi as the top ten (10) include: William Arms, Christine Borgman, Hector Garcia-Molina, Edward A. Fox, Carl Lagoze, Michael Lesk, Richard Lucier, Clifford Lynch, Gary Marchionini, Bruce Schatz, and Terence R. Smith."

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# Countries & Regions:

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(Chapter 11, page 245, "Books, Bytes and Bucks", Michael Lesk)

- **United States of America:** In the US, NSF, NASA and ARPA have funded six important Digital Library efforts, called the DLI (Digital Libraries Initiative). These programs each involve a large consortium of cooperating institutions but the six main ones are : University of California at Berkeley, University of Santa Barbara, University of Michigan, Carnegie Mellon University, Stanford University, and the University of Illinois.
  - University of California at Berkeley: Image content queries along with Xerox PARC, database extraction from documents, multivalent documents, NLP. Headed by Robert Wilensky.
  - University of Michigan: Scalability and Education. They are also investigating the use of agent architectures for Digital Libraries and trying to merge DLI with their other digital library efforts such as JSTOR and TULIP. Headed by Dan Atkins.
  - University of Illinois: Concentrating of using scientific journals as their base collection with diversity in both documents as well as publishers, making the transition process from SGML to HTML smoother, defining semantic spaces. Headed by Bruce Schatz.
  - Stanford University: concentration is on the infrastructure development such as bas networking and databases to support digital libraries. Also concerned with interoperability between different digital library projects. Headed by Hector Garcia-Molina.
  - University of California at Santa Barbara: spatial indexing and retrieval , image processing. Headed by Terry Smith.
  - Carnegie Mellon University: digital video, image analysis, speech recognition, face recognition, natural language understanding. Headed by Michael Mauldin and Marvin Sirbu.

Other than DLI, many research projects are underway at some other universities such as Virginia Tech and Texas A&M. In the near future, extensive funds are expected to be allocated for Digital Libraries.

The Library of Congress, under James Billington is digitizing 5 million of its items in a massive \$60 million effort. Other universities involved in related projects are Georgia Tech, Cornell, MIT, University of Tennessee, Washington and California and Virginia Tech (known for the Envision system of Ed Fox). Other limited efforts include University of Virginia, University of Georgia and Columbia University.

- **United Kingdom:** Though efforts are still limited to penny-pockets, 20 million pounds have been

set aside from digital library projects. The program originally called FIGIT, now known as E-LIB funded 35 projects. Work includes cataloging of archives, digitization of documents and data sharing. Some of the more notable efforts are : Digitizing the Burney collection of pre-1800 newspapers and scanning of Batley News, the Canterbury Tales project that involves scanning all pre-1500 manuscripts and some other similar projects. However, the most notable is the Electronic Beowulf project which is a US/UK collaboration between Kevin Kiernan (University of Kentucky), Paul Szarmach (Western Michigan University) and the British Library.

- **France:** Work includes some scanning of old manuscripts with the most notable being the Tresor de la Langue Francaise project at the University of Nancy. The French, along with the Japanese are also leaders in the Group 7 project which is a museum project. Other efforts are INIST and FOUORE (1989 to 1992) followed by EDIL and ELITE.
- **The EU:** The European Union funds a large number of international efforts in digital libraries. (Please see page 255 of Michal Lesk's book for details)
- **Japan:** Japan is involved in some digitization and cataloguing efforts and has a \$50M project on. They are also working on modern document delivery and OCR.
- **Australia:** Australia has recently made a modest effort to enter into digital library research. They are planning some digitization projects with a \$10M (Australian) digitization project on the anvil. They are also interested in digitizing Aborigine scriptures and paintings.
- **Elsewhere:** Many other countries are involved in digital library research on much smaller scales. Notable amongst them are Canada, Singapore, Korea and China.

**NOTE 1:** For detailed information on any of the above please refer to Dr. Lesk's book (recommended as supplement text for this course).

**NOTE 2:** See also the table pointing to various national digital libraries from April 1998 CACM [online pages](#)

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See also [DLI2 International Digital Libraries Projects](#)

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# Centers, sites and organisations:

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**Some major Digital Library centers and research programs, separately described:**

- [Carnegie Mellon University](#)
  - [CNRI](#)
  - [Library of Congress](#)
  - [Stanford University](#)
  - [University of California at Berkeley](#)
  - [University of California at Santa Barbara](#)
  - [University of Illinois](#)
  - [University of Michigan](#)
  - [Texas A&M](#)
  - [Virginia Tech](#)
- 

## Selected other sites:

**[ACM DL](#)** : Tap into the ACM Digital Library, a vast resource of bibliographic information, citations, and full-text articles.

**IEEE-CS** [Digital Library](#)

## IBM

- [IBM DL Home page](#)
- [IBM Renaissance Consortium Panel](#) and [workshop](#)
- [images - QBIC](#)

**[National Library of Medicine](#)**

**[Digital Library Research Program](#)** at

**[Lister Hill National Center for Biomedical Communications,](#)**

**[National Institutes of Health](#)**

**[OCLC](#)** (OCLC is a nonprofit, membership, library computer service and research organization dedicated to the public purposes of furthering access to the world's information and reducing

information costs).

- Research <http://www.oclc.org/research/>;

SiteSearch <http://www.oclc.org/oclc/menu/site.htm>

**Xerox**

- [DL Interfaces Home Page](#)
- [Scientific American article](#)
- [Scatter/Gather examples](#)
- Questions:
  - Compare
    - What are the various interfaces built? How do they compare? What is the best use of each?
  - Scatter/gather
    - Explain clustering, relate it to scatter/gather.
    - What are special problems with large category systems and how can they be solved?

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[Text Version](#)



UNITED STATES

# National Library of Medicine

[Site Index](#) | [Search Our Web Site](#)

## HEALTH INFORMATION

MEDLINE/PubMed, MEDLINEplus, NLM Gateway

*Welcome to the world's largest medical library  
and creator of MEDLINE/PubMed.*

## LIBRARY SERVICES

Catalog, Databases, Publications, Training, Grants

## RESEARCH PROGRAMS

Computational Molecular Biology, Medical Informatics

## NEW & NOTEWORTHY

Announcements, Exhibits, New on this Site, Hot Topics

## GENERAL INFORMATION

Visiting the Library, FAQs, Staff, Jobs, Contracts

**ClinicalTrials.gov**

*provides information  
for patients about  
clinical research studies*



**Now featuring  
the latest  
health news**

**Go To  
MEDLINEplus  
Health Information**



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[U.S. National Library of Medicine](#), 8600 Rockville Pike, Bethesda, MD 20894

[National Institutes of Health](#), [Department of Health & Human Services](#)

[Copyright and Privacy Policy](#), [Freedom of Information Act](#), [Accessibility](#)

**FIRSTGOV**



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About OCLC  
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Search OCLC

## OCLC Reference Services

### Considering SiteSearch?

- [Overview](#)
- [Solutions for your library](#)
- [Technical Information](#)
- [Guided Tour](#)
- [Demonstrations](#)
- [Components](#)
- [Look what you're doing now:](#)

- [University of Arizona](#)
- [INCOLSA](#)
- [Virtual Illinois Catalog](#)
- [Kentucky Commonwealth Virtual Library](#)

- [Advantages](#)
- [How to Order](#)

# OCLC SiteSearch

The OCLC SiteSearch suite provides a comprehensive solution for managing distributed library information resources in a World Wide Web environment. It offers tools that **integrate** electronic resources under one web interface, provide flexible **access** to resources, and **build** unique databases locally.



### Using SiteSearch?

- [Product Requirements](#)
- [News](#)
- [Training](#)
- [Users Web Site--Help Zone](#)
- [Support](#)

# Interfaces for Information Access

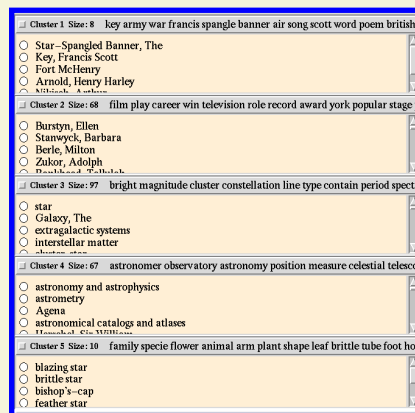
## Companion Pages for *Scientific American* Article [Interfaces for Searching the Web](#)

The field of Information Access concerns helping people find, use, understand, and create the information they need, often using computer systems as tools. Information can be found in many forms and media, although much of our research has been concerned with text in general, not focusing exclusively on the Web.

Text analysis and user interface technology must be combined with an understanding of how users work with information and computer tools when building systems to support information access.

Currently, these pages provide additional information about some of the ideas discussed in the *Scientific American* article *Interfaces for Searching the Web* by [Marti Hearst](#). There is a great deal of research in Information Access at [Xerox PARC](#), of which this pages show only a small sample.

### [About Scatter/Gather](#)



### [About Tilebars](#)

# SCIENTIFIC AMERICAN

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## FEATURE ARTICLES

### SPECIAL REPORT

# Interfaces for Searching the Web

**The rapid growth of the World Wide Web is outpacing current attempts to search and organize it. New user interfaces may offer a better approach**

*by [Marti A. Hearst](#)*



#### SUBTOPICS:

[The \(Slow\) Speed of Thought](#)  
[Organizing Search Results](#)

#### [FURTHER READING](#)

#### [BACK TO THE INTRODUCTION](#)

How does anyone find anything among the millions of pages linked together in unpredictable tangles on the World Wide Web? Retrieving certain kinds of popular and crisply defined information, such as telephone numbers and stock prices, is not hard; many Web sites offer these services. What makes the Internet so exciting is its potential to transcend geography to bring information on myriad topics directly to the desktop. Yet without any consistent organization, cyberspace is growing increasingly muddled. Using the tools now available for searching the Web to locate the document in Oregon, the catalogue in Britain or the image in Japan that is most relevant for your purposes can be slow and frustrating.

More sophisticated algorithms for ranking the relevance of search results may help, but the answer is more likely to arrive in the form of new user interfaces. Today software designed to analyze text and to manipulate large hierarchies of data can provide better ways to look at the contents of the Internet or other large text collections.

# A Scatter/Gather Example

Here we demonstrate the use of Scatter/Gather on a collection of encyclopedia articles. Our query is very simple:

**Retrieve the top 250 documents that contain the word *star* .**

Here we show that Scatter/Gather text clustering does a reasonably good job at organizing the documents into meaningful themes or topics.

We ask Scatter/Gather to place the 250 documents into 5 groups. Here is what results. (Bear in mind that encyclopedia articles are well-written and uniform format. The [next example](#) shows the results of a more complicated query on a more unruly text collection.)

<input type="checkbox"/> Cluster 1 Size: 8	key army war francis spangle banner air song scott word poem british
<input type="radio"/> Star-Spangled Banner, The <input type="radio"/> Key, Francis Scott <input type="radio"/> Fort McHenry <input type="radio"/> Arnold, Henry Harley <input type="radio"/> Millican, Arthur	
<input type="checkbox"/> Cluster 2 Size: 68	film play career win television role record award york popular stage p
<input type="radio"/> Burstyn, Ellen <input type="radio"/> Stanwyck, Barbara <input type="radio"/> Berle, Milton <input type="radio"/> Zukor, Adolph <input type="radio"/> Deakins, Ted	
<input type="checkbox"/> Cluster 3 Size: 97	bright magnitude cluster constellation line type contain period spectr
<input type="radio"/> star <input type="radio"/> Galaxy, The <input type="radio"/> extragalactic systems <input type="radio"/> interstellar matter <input type="radio"/> cluster, star	
<input type="checkbox"/> Cluster 4 Size: 67	astronomer observatory astronomy position measure celestial telescop
<input type="radio"/> astronomy and astrophysics <input type="radio"/> astrometry <input type="radio"/> Agena <input type="radio"/> astronomical catalogs and atlases <input type="radio"/> Herschel, Sir William	
<input type="checkbox"/> Cluster 5 Size: 10	family specie flower animal arm plant shape leaf brittle tube foot hor
<input type="radio"/> blazing star <input type="radio"/> brittle star	

# Search, retrieval, resource discovery:

---

## Searching - LoC

- [LoC Home Page](#)
- [Z39.50 maintenance agency; part 1](#)
- [The WWW Virtual Library arranged by LoC standards](#)
- [Understanding and Comparing Web Search Tools](#)
- [Matrix of WWW Indices: A comparison of Internet indexing tools](#)

## **Federated search**

- [UIUC Federation Across Heter. DBs](#)
- [STARTS](#)
- [INFOSEEK patent](#)
- [TSIMMIS](#)
- [Virginia Tech Federated Search Demonstration for NDLTD \(theses, dissertations\)](#)
- [Emerge \(NCSA component architecture\)](#)

## **CyberStacks (WWW, Classification, Catalogs, Reviews/Clearinghouses)**

- [Home Page](#)
- [Net Projects](#)
- [Alphabetical topics vs. LC ranges](#)
- [Call for contributions](#)
- Question: Which efforts are far along? What demonstrations can you find that are the most informative / explanatory? How well does the Library of Congress classification system fit for WWW resources?
- Related work: [OCLC's Scorpion Project](#); [DDC](#); [Mantis](#); [CORC](#)

## **Columbia**

- [D-Lib Article on Images/Video](#)
- [WebSeek Home Page](#)

## Database Groups

## **Filtering**

- [Defn](#) from U. Md. [Information Filtering Project](#)
- [Paracel automated genomic sequence and text analysis systems](#)
- What is *information filtering*? How does it differ from information retrieval?

## Cross-Language Information Retrieval Resources

- [Eurospider](#) and [ISN LASE Search demo](#)
- [Readware](#)
- [Mundial](#) - English and Spanish Demo
- Questions:
  - What languages are covered?
  - How well are phrases handled?

## Stanford DL info finding projects

[Berkeley documents and queries](#) (please study carefully, answering questions)

## UCSB spatial indexing and retrieval

---

[\[Main\]](#) [\[Contents\]](#) [\[Topics\]](#)

---

Please send comments/suggestions to [Ed Fox](#).

(c) Copyright 1998-2001, Edward A. Fox, Rajat Gupta



Go to: [Multiple Resource Types](#) | [World Wide Web by Subject](#) | [Directories of E-mail Addresses](#) | [FTP Sites and Archives](#) | [Gopher, HYTELNET, and Telnet Servers](#) | [Listservs, Usenet, and Discussion Groups](#) | [Comparisons and Reviews of Search Tools](#)

---

Unless otherwise noted, the sites listed in this directory are provided by organizations outside the Library of Congress. These links are offered as a convenience and for informational purposes. Their inclusion here does not constitute an endorsement or an approval by the Library of Congress of any of the products, services, or opinions of the external provider. The Library of Congress bears no responsibility for the accuracy or the content of external sites. Please contact the external site's administrator for any questions regarding these sites.

---

## Multiple Resource Types

The following sites provide searching or browsing of more than one type of service (World Wide Web, Gopher, Discussion Groups, etc).

- [All-In-One Search Page](#), William Cross  
A compilation of over 100 forms-based Internet search tools, grouped by category.
- [The Argus Clearinghouse](#) (Argus Associates, Inc.)  
Subject-oriented research guides (formerly The Michigan Clearinghouse)
- [Internet Sleuth](#) (Internet Business Connection <sup>TM</sup>)  
Choose from over 1500 searchable databases.
- [Galaxy](#) (TradeWave Corporation)  
A guide to worldwide Internet information and services.
- [SavvySearch](#)  
Queries multiple internet search engines simultaneously.

---

## World Wide Web by Subject or Keyword

International Standard  
Maintenance Agency

# Z39.50

The Library of Congress  
Network Development  
& MARC Standards Office

[Z39.50 Resources](#) - [Z39.50 Document](#) - [Related Specifications](#) - [Object Identifiers](#)  
[Implementor Register](#) - [Z39.50 Profiles](#) - [ZIG Meetings](#) - [Site Index](#)

This page provides links to information about Z39.50 resources and about the development and maintenance of Z39.50 (existing as well as future versions) and the implementation and use of the Z39.50 protocol.

"Z39.50" refers to the International Standard, ISO 23950: "Information Retrieval (Z39.50): Application Service Definition and Protocol Specification", and to ANSI/NISO Z39.50. The Library of Congress is the Maintenance Agency and Registration Authority for both standards, which are technically identical (though with minor editorial differences).

The standard specifies a client/server-based protocol for searching and retrieving information from remote databases.

## Next ZIG Meeting October 2001: Boston Spa, UK

- [Preliminary information](#)
- [Registration](#)

[Output from December Meeting](#)

[The ZNG Initiative:  
"Z39.50 Next Generation"](#)

[Status of Z39.50-2001  
\(Revision/re-affirmation\)](#)

[Comments: z3950@loc.gov](mailto:z3950@loc.gov)  
[Maintenance Agency Procedures](#)

---

[Library of Congress Home](#) - [Other Standards Maintained by the Library](#) - [Z39.50 Gateway](#)

---



Library of Congress  
General Comments:  
[lcweb@loc.gov](mailto:lcweb@loc.gov)

Updated: July 27, 2001



# The WWW Virtual Library



- **Agriculture**  
[Agriculture](#), [Gardening](#), [Forestry](#), [Irrigation](#)...
- **Business and Economics**  
[Economics](#), [Finance](#), [Marketing](#), [Transportation](#)...
- **Computing**  
[Computing](#), [E-Commerce](#), [Languages](#), [Web](#)...
- **Communications and Media**  
[Communications](#), [Telecommunications](#), [Journalism](#)...
- **Education**  
[Education](#), [Applied Linguistics](#), [Linguistics](#)...
- **Engineering**  
[Civil](#), [Chemical](#), [Electrical](#), [Mechanical](#)...
- **Humanities**  
[Anthropology](#), [History](#), [Museums](#), [Philosophy](#)...
- **Information & Libraries**  
[General Reference](#), [Information Quality](#), [Libraries](#)...
- **International Affairs**  
[International Security](#), [Sustainable Development](#), [UN](#)...
- **Law**  
[Arbitration](#), [Law](#), [Legal History](#)...
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[Recreation and Games](#), [Gardening](#), [Sport](#)...
- **Regional Studies**  
[African](#), [Asian](#), [Latin American](#), [West European](#)...
- **Science**  
[Biosciences](#), [Health](#), [Earth Science](#), [Physics](#), [Chemistry](#)...
- **Society**  
[Political Science](#), [Religion](#), [Social Sciences](#)...

---

**Search the WWW VL:**

Match:

Format:

([help](#))

---

# UNDERSTANDING AND COMPARING WEB SEARCH TOOLS

*updated February 1999*

## [Beyond Surfing: Tools and Techniques for Searching the Web](#)

by Kathleen Webster & Kathryn Paul  
January 1996

## [General Internet Resource Finding Tools:](#)

A Review and List of Those Used to Build INFOMINE  
March 1996 ; updated 5/14/96

## [How to Search the Web - A Guide to Search Tools](#)

by Terry A. Gray

## [Introduction to Search Engines](#)

Kansas City Public Library  
January 1999

## [Jacob Hausauer's Page for Search Engines](#)

March, 1996; updated May 24th, 1998.

Just the Answers, Please ©,  
Susan Feldman  
Searcher Magazine, 1997

*note: this paper is no longer linked online, but may be available in a library in print form.*

## [Librarians' Index to the Internet](#)

Lots of useful links about searching. Be sure to check "about" [Literature about search services](#)  
by Traugott Koch  
January, 1996; updated Nov., 1996; February 1, 1999

## [Precision among World Wide Web Search Services \(Search Engines\): Alta Vista, Excite, Hotbot, Infoseek, Lycos](#)

By H. Vernon Leighton and Dr. Jaideep Srivastava  
June 1997; updated 8/29/97

## [Reviews of Search Engines](#)

from the Search Page.  
June 1996; updated, November 1996, January 22, 1999.

# Matrix of WWW Indices

## A comparison of Internet indexing tools

---

You are the [3837th visitor](#) to this page. If the counter value didn't show up properly, make sure that you have entered the proper URL:

<http://www.avaloncity.com/info/fprefect/matrix/matrix.shtml>

---

This collection documents my evaluation of various Web search engines and subject catalogs. It is intended as a guide for new users and as a checklist for Internet users seeking particular functionality in their tools. The Matrix currently describes more than 12 servers, and [many more are planned](#). This is not a finished product, but a dynamic document that stays current and relevant. I plan on adding new services and revising outdated information.

I am currently finishing the necessary work to setup the Matrix. My current effort is to build the graphic checklist and link the image to specific portions of the collection, then complete the evaluation portions of the pages. The next step will then be to complete the administrative documents, and post public announcements to various newsgroups and What's New services. Finally, I plan on keeping the matrix alive and current... a continuing process of research and updates.

---

## Administrative Documents

### [Graphical Evaluation Matrix](#) (*Text Only*)

The goal of the project, this is a graphic checklist identifying key features and support issues I found relevant. Each section of the charts are linked to the relevant documents in the collection.

### [Sample Evaluation](#)

This is the template document from which I build each evaluation. It demonstrates the criteria and organization of individual evaluations.

### [Vocabulary Page](#)

A reference page for selected terms used throughout this collection. The discussion assumes you have familiarity with basic Web concepts and terms; if not, you should refer to the [Overview of the Internet](#) documents.



## CONTENTS



### Minutes



### Presentations



### AGENDA

## FEDERATION ACROSS HETEROGENEOUS DATABASES

April 3-4, 1997

Grainger Engineering Library Information Center

University of Illinois at Urbana-Champaign  
1301 W. Springfield Ave., Urbana, IL

Welcome to the official site for the UIUC Digital Library  
Initiative Spring '97 Partners Workshop.

Please contact Susan Harum [dli@uiuc.edu](mailto:dli@uiuc.edu) for any questions  
or comments about the workshop.

[Go back to the DLI workshop page](#)

# **STARTS**

## **Stanford Protocol Proposal for Internet Retrieval and Search**

*STARTS* is the result of an informal "standards" effort that we ([Luis Gravano](#), [Kevin Chang](#), [Hector Garcia-Molina](#), [Carl Lagoze](#), and [Andreas Paepcke](#)) coordinated at Stanford. This project developed a simple protocol that text search engines should follow to facilitate searching and indexing multiple collections of text documents.

[Final writeup](#) of the *STARTS* protocol ([PostScript version](#))

[A reference-implementation](#) of *STARTS* by Carl Lagoze

[A more readable description](#) of the *STARTS* protocol that appeared in Sigmod'97

[List of participants](#) of the *STARTS* Workshop, Stanford, August 1st, 1996

Slides of the talk that Prof. Hector Garcia-Molina gave at the *STARTS* workshop ([Powerpoint Version](#))

Slides of the talk that Luis Gravano gave at the *STARTS* workshop ([Powerpoint Version](#))

---

[Luis Gravano](#)

[gravano@cs.stanford.edu](mailto:gravano@cs.stanford.edu)



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## Distributed Search Patent

The Infoseek Distributed Search patent is a novel technique for performing full-text searches over distributed databases. The technique is directly applicable to searching web sites on the Internet, as well as geographically distributed databases within corporate Intranets. The patent, US Patent Number 5,659,732, entitled "Document Retrieval over networks wherein ranking and relevance scores are computed at the client for multiple database documents," was issued on August 19, 1997.

### [Press release](#)

The official corporate press release announcing the patent

### [Background information](#)

An expanded press release containing more technical information and additional background information

### [News Articles](#)

News articles appeared in [The New York Times](#), [Inter@ctive Week](#), and [CNET](#).

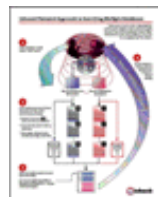
### [Patent text](#)

Text of the patent

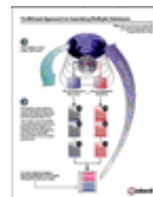
### [Graphic](#)

Illustration of traditional vs. Infoseek patent approach. This file contains two pages: the first page depicts the traditional approach, while the second page portrays the Infoseek patented approach. Available in GIF (left) or PDF (below) format.

pdflogo.jp  
(1322

[PDF format](#)

[Infoseek Approach](#)  
[\(GIF\)](#)



[Traditional Approach](#)  
[\(GIF\)](#)



## Why the name?

As an acronym, TSIMMIS stands for "*The Stanford-[IBM](#) Manager of Multiple Information Sources.*" In addition, TSIMMIS is a Yiddish word for a stew with "heterogeneous" fruits and vegetables integrated into a surprisingly tasty whole.

## Short Project Description

The goal of the TSIMMIS Project is to develop tools that facilitate the rapid integration of heterogeneous information sources that may include both structured and semistructured data. TSIMMIS has components that:

- translate queries and information (source wrappers);
- extract data from World Wide Web sites;
- combine information from several sources (mediator);
- allow browsing of data sources over the Web.

The TSIMMIS project is funded by [DARPA](#).

## TSIMMIS Links

- TSIMMIS [publications](#)
- [People](#) in the TSIMMIS project
- [Developer's page](#) (restricted access)

## TSIMMIS Related Links

- [LORE](#), an OEM repository
- [I3 Initiative Projects Home Page](#)
- [DARPA Progress Reports](#)

# ETD Digital Library

Networked Digital Library of  
Theses and Dissertations:  
Federated Search

---

## About ETD Federated Search

Federated Searcher allows users to perform parallel queries across several dozen search sites provided by participants of the Electronic Theses and Dissertations Project. Each site is described using a specially designed XML markup language called *SearchDB*. A Java-based federated search server maps queries to each site you select by using the XML description as a submission template. It submits each query and collects results as each site replies. Currently, each result set is presented as a separate document, although future plans include result set merging.

[Show me all ETD sites](#)

or

Find cataloged sites about

## Search or Browse the Catalog

One of the many ways in which this service differs from other "metasearch" services is in its use of metadata for search sites. The first step to performing a federated search is to select the sites you would like to search. Each site has a local description that includes information about its particular specialty. So if you want to perform searches to help you decide where you should take your next vacation, you can search the catalog for **Computer Science** and then perform federated searches for things like **object oriented programming** or **Java** or **research results** against those sites most likely to index documents about computer science.

---

[All ETD sites currently included in the Federated Search](#)

Questions? Comments? [etd@ndltd.org](mailto:etd@ndltd.org)

---

[NDLTD](#)

---



[emerge@ncsa.uiuc.edu](mailto:emerge@ncsa.uiuc.edu)

# About EmERGE

EmERGE is an NCSA effort to develop middleware components of a new distributed search infrastructure which addresses the scale and heterogeneity of scientific data. Our components enable search services to interoperate across scientific domains by providing user-configurable tools for mapping between metadata schemas, performing search queries against multiple data sources, and performing query pre- and post-processing. Access to our search services is through platform-neutral standard and emerging-standard tools such as [Z39.50](#), [Open Archives](#), [XML](#), and [Java](#).

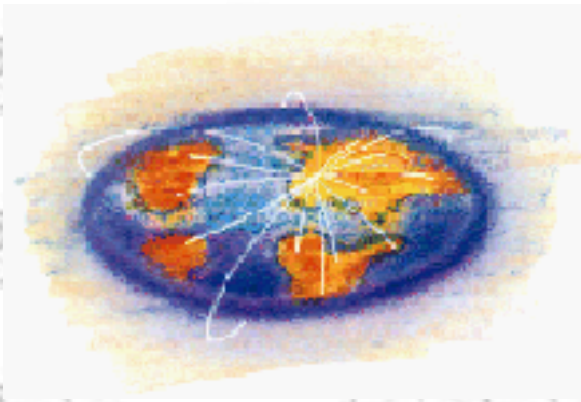
Here's a [slide show](#) with an overview of our research area and component architecture. And [here's one](#) which gives an overview of interoperability issues in distributed scientific information retrieval.

## Collaborations

EmERGE is part of [NCSA's Data Mining and Visualization Division](#). Our components have been developed in collaboration with the [National Cancer Institute](#), the UIUC Digital Library Initiative and [CANIS](#), [NASA Project 30](#). We've also participated in panel discussions and advisory meetings with the [Committee for Institutional Cooperation](#) and the [UIUC Library Gateway](#) project.

EmERGE is currently helping to build the National Biological Digital Library in collaboration with the [University of Missouri](#), the [Missouri Botanical Garden](#), and the [Graduate School of Library and Information](#)

[Science](#) at UIUC. The NBDL is an NSF-supported effort to engage the education community in the development and use of federated plant science data collections.



## CyberStacks(sm)

### Welcome To CyberStacks(sm)!

CyberStacks(sm) is a *centralized, integrated, and unified* collection of significant World Wide Web (WWW) and other Internet resources categorized using the Library of Congress classification scheme. Resources are organized under one or more relevant Library of Congress class numbers and an associated publication format and subject description. The majority of resources incorporated within its collection are monographic or serial works, files, databases or search services. All of the selected resources in *CyberStacks(sm)* are *full-text, hypertext, or, hypermedia*, and of a research or scholarly nature.

Using an abridged Library of Congress call number, *Cyberstacks(sm)* allows users to browse through a virtual library stacks to identify potentially relevant information resources. Resources are categorized:

- \* first within a broad classification,

- \* then within narrower subclasses,

- \* and then finally listed under a specific classification range and associated subject description that best characterize the content and coverage of the resource.

For each resource, a brief summary is provided, and when necessary, specific instructions on using the resource are also included. Where appropriate, the mode of access to the resource is noted, as is the subject coverage and scope; notable features, where applicable, are also included.

# Cross-Classification Index

<a href="#"><u>Acoustics. Sound</u></a>	QC 220-246
<a href="#"><u>Aeronautics</u></a>	TL 500-778
<a href="#"><u>Agricultural Chemistry. Agricultural Chemicals</u></a>	S 583-587.5
<a href="#"><u>Agricultural Extension Work</u></a>	S 544-545)
<a href="#"><u>Agricultural Meteorology, Crops and Climate</u></a>	S 600-600.7
<a href="#"><u>Agriculture (General). Directories</u></a>	S 409
<a href="#"><u>Agriculture (General). General Works</u></a>	S 491-523
<a href="#"><u>Agriculture (General). History</u></a>	S 419-471
<a href="#"><u>Agriculture (General). Research. Experimentation</u></a>	S 539.5-542
<a href="#"><u>Algebra w/Machine Theory, Game Theory</u></a>	QA 150-272
<a href="#"><u>Analytical Chemistry</u></a>	QD 71-142
<a href="#"><u>Angiosperms</u></a>	QK 495
<a href="#"><u>Animal Biochemistry</u></a>	QP 501-801
<a href="#"><u>Anthropology</u></a>	GN 1-890
<a href="#"><u>Aquaculture, Fisheries, &amp; Angling (General)</u></a>	SH 1-400
<a href="#"><u>Astronautics</u></a>	787-4050
<a href="#"><u>Astronomy (General)</u></a>	QB 1-139
<a href="#"><u>Astrophysics</u></a>	QB 460-466
<a href="#"><u>Atomic Physics. Constitution and Properties of Matter w/ Quantum Theory, Solid-State Physics</u></a>	QC 170-197
<a href="#"><u>Biology (General)</u></a>	QH 301-425
<a href="#"><u>Biomedical Engineering, Electronics, Instrumentation</u></a>	R 856-857
<a href="#"><u>Birds</u></a>	QL 671-699
<a href="#"><u>Birds w/Cage Birds, Pigeons, Poultry, Game Birds</u></a>	SF 460-513
<a href="#"><u>Botany (General)</u></a>	QK 1-474.5
<a href="#"><u>Breeds &amp; Breeding w/Artificial Insemination, Stock Farms</u></a>	SF 105-109
<a href="#"><u>Chemistry. Communication of Chemical Information</u></a>	QD 8-9



# The Scorpion Project





[Scorpion](#) is a project of the [OCLC Office of Research](#) exploring the indexing and cataloging of electronic resources. Since subject information is key to advanced retrieval, browsing, and clustering, the primary focus of Scorpion is the building of tools for automatic subject recognition based on well known schemes like the [Dewey Decimal System](#).

---

## Scorpion Documentation

- [A brief introduction to Scorpion](#)
- [Evaluating Dewey Concepts](#)
- [Evaluating Scorpion Results](#)
- [Measures for Evaluating ...](#)
- [Clustering](#)
- [AMIGOS 97](#) (full image [version](#))
- [Scorpion helps catalog the Web](#)
- [Dewey Database Design](#)
- [ESS Field Label Descriptions](#)
- [Example ESS Record](#)
- [SMART Weighting Schemes](#)
- [Scorpion Usage Stats \(OCLC Internal Use Only\)](#)

## Automatic Subject Assignment

-  [Input Form for LCC or DDC Results](#)
-  [Advanced Input Form for DDC only](#)

*CAVEAT CLASSIFIER: This is an older version of Scorpion, which offers more functionality, but which is no longer supported*

### *Special Note:*

I have removed the links to the old versions of the Scorpion demo. If you have any problems with the new forms, or have any questions/comments/etc. please contact me. Thank you!

[Devon Smith](#)

Thank you for your interest in the Scorpion project. The Research phase of this project that provided automatic subject assignment using the Dewey Decimal Classification

# Dewey Decimal Classification

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## Welcome!

### Tip of the Week

## [Building Your Dewey Knowledge](#)

### Featured Product

## [WebDewey in CORC](#)



power of Dewey on the Web.

WebDewey in CORC™, which provides Web-based access to an enhanced version of the full Dewey Decimal Classification® (DDC®) system database, is now available to OCLC full cataloging members and partial users. If your library has an OCLC cataloging authorizations, you can experience the



### Featured Library

## [William R. Perkins Library System, Duke University](#)



**MANTIS** is a research toolkit developed at [OCLC](#) for building arbitrary Web-based cataloging systems. Mantis has been packaged for external use in [SiteSearch Release 4.1](#). If you want to see Mantis in action, please check out the [live CORC System](#) or read about CORC on [CORC's main web site](#).

The following systems were built using Mantis. Please do not be surprised if several features in Mantis Demo, OCLC Institute, and Pirate interfaces have broken as advances were made in the toolkit, but not reflected in every old system. The links have been left here for internal OCLC purposes.

[CORC](#)

[CORC Practice](#)

[CORC Development](#)

---

## DOCUMENTATION

[Toolkit/system overview](#)

[Related projects](#)

[EDUCOM '98 presentation](#)

[RAC August 1998 presentation](#)

---

Mantis comments or suggestions? Please contact [Keith Shafer](#).

Last updated March 29, 2000.

# Finding Images/Video in Large Archives

## Columbia's Content-Based Visual Query Project

Shih-Fu Chang, John R. Smith  
Horace J. Meng, Hualu Wang, and Di Zhong  
Department of Electrical Engineering and  
Center for Telecommunications Research  
Columbia University

*{sfchang,jrsmith,jmeng,hwang,dzhong}@ctr.columbia.edu*

**D-Lib Magazine**, February 1997

ISSN 1082-9873

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- [An Application Driven Problem](#)
  - [State of the Art](#)
  - [Research Strategies](#)
  - [Prototype Systems](#)
  - [Testbed Support and User Evaluation](#)
  - [Open Issues](#)
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- 

## An Application Driven Problem

How do we find a photograph from a large archive which contains thousands or millions of pictures? How does a CNN video journalist find a specific clip from the myriad of video tapes, ranging from historical to contemporary, from sports to humanities? How do people organize and search the content of personal video tapes of family events, travel scenes, or social gatherings?

The era of "the information explosion" has brought about the wide dissemination and use of visual information, particularly, digital images and video, which we are also seeing in combination with text, audio, and graphics. The development of tools and systems that enhance image functionalities, such as searching and authoring, is critical to the effective use of visual information in the new media applications.



at Columbia University

# A Content-Based Image and Video Search and Catalog Tool for the Web

( press here to Browse all subjects )

## Animals

birds, dinosaurs,  
monkeys, fishes

## Architecture

bridges, lighting, domes  
heating

## Art

painting, illustr,  
sketching cezanne,  
monet, vangogh

## Astronomy

nasa, planets, eclipses,  
space

## Cats

leopards, lions, kittens,  
cheetahs

## Celebrities

bullock, aniston, monroe,  
keanu

## Dogs

bulldogs, puppies,  
coyotes, wolves

## Food

apples, beer, pizza, cakes,  
fruits, veges

## Horror

godzilla, aliens,  
skeletons, monsters

## Humour

simpsons, beavis, dilbert,  
ren/stimpy

## Movies

batman, starwars,  
jurassic, python, blade  
runner, actresses

## Music

beatles, metal, rock, cure,  
zeppelin, guitars

## Nature

sunsets, flowers, weather,  
mountains

## Sports

baseball, basketball,  
swimming, hockey,  
olympics, surfing

## Transportation

cars, planes, titanic,  
motorcycles, porsches

## Travel

asia, europe, newyork,  
paris, australia, mexico

Image/Video Topic

(single word)

# Database Groups:

---

- [Garlic - IBM Almaden](#)
- [Penn.](#)
- [Stanford](#)
- [U. Md.](#)
- [UCB database management](#)  
and the Open Source Berkeley DB: [Sleepycat Software](#)
- [Oracle](#)

---

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Please send comments/suggestions to [Ed Fox](#).

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Research

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# The Garlic Project

## Introduction

Garlic is a project being developed by members of the database group in Computer Science. The goal of Garlic is to enable large-scale multimedia information systems: large scale in that they involve lots of data with multimedia taken as broadly as possible to mean data of many types. We are particularly concerned about situations in which there is enough data of sufficiently specialized types that users have already made decisions about how to manage it, and have stored it in separate repositories that are specifically adapted to data of that type.

## The Need:

The bulk of the data in the world is not stored in database management systems. There are many specialized systems emerging to store and search for particular data types, including image management systems, etc. However, many applications can benefit from combining information from these various systems.



## In Medicine:

For example, in the medical field, hospitals often have separate information systems for each department. Radiology may store MRI scans, etc., in one system, Cardiology may store EKG's in another, the Lab may store lab reports in a document management system, and Administration may store its records in a relational DBMS. Doctors, however, need access to all of this information when treating a patient. Today, hard copies are made and collected in a folder, leading to delays and inconsistencies. In the future, hospitals would like to be able to store patient folders on-line,





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PENN Database Research Group

## Welcome to the lair of the PENN Database Research Group.



**NEW!** [Our Technical Mailing Lists](#) **NEW!**

**NEW!** [Some useful resources](#) **NEW!**

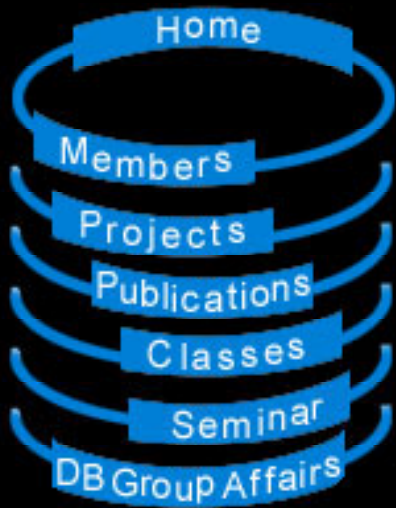
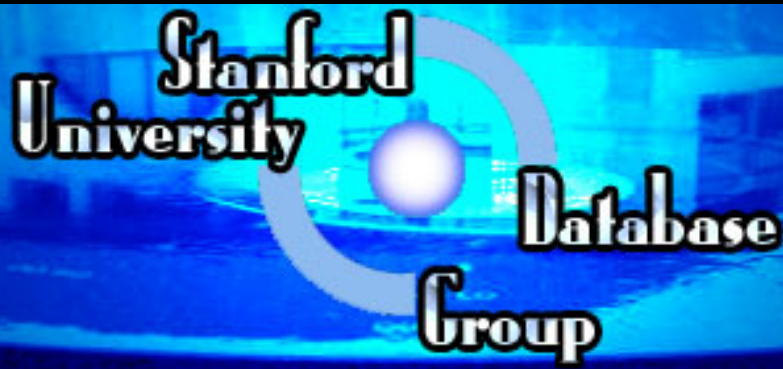
Feel free to search our Web site (append your query after the prefix)

[Link to our old web site](#)



[Comments](#) Last update: 08/13/01

[News](#) | [People](#) | [Publications](#) | [Research](#) | [Demo](#) | [Classes](#) | [Seminar](#) | [Resources](#)



## Welcome

- We are co-chairing the [International Semantic Web Workshop](#), Stanford, July 30-31, 2001.
- [Database System Implementation](#), by Hector Garcia-Molina, Jeff Ullman and Jennifer Widom was published recently (Prentice-Hall, 2000). The new book is a companion to Jeff and Jennifer's [A First Course in Database Systems](#) (Prentice-Hall, 1997).
- [Useful Resources](#)
- [Directions](#) to the Gates Computer Science Building

Maintained by [Orkut](#)



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PROJECTS



PAPERS



CLASSES



SEMINAR



CHAT



PHOTOS



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LINKS

# Database Group University of Maryland

Welcome to the web page of the database research group of the [Department of Computer Science](#) of the [University of Maryland](#).

We are located in the [A. V. Williams](#) building of the [College Park](#) campus. The 7 [faculty](#) members of the group lead efforts in many different research areas through various [projects](#) and work closely with the [Institute for Advanced Computer Studies](#) and the [Institute for Systems Research](#). Our group is ranked [4th](#) in the country.

## Recent News:

**Fall 2001:** [DBChat](#) is offered as a one credit seminar course ([CMSC828R](#)).

[Ugur Cetintemel](#) (PhD) joins [Brown University](#).

[Manuel Rodriguez-Martinez](#) (PhD) joins the [University of Puerto Rico](#).

[Fatma Ozcan](#) (PhD) joins [IBM Almaden](#).

[Vladimir Zadorozhny](#) (PostDoc) joins the [University of Pittsburgh](#).

**Fall 2000:** [Gisli Hjaltason](#) (PhD) joins [RightOrder](#)

[Tolga Urhan](#) joins (PhD) [Propel](#)

[Alexander Dekhtyar](#) (PhD) joins the [University of Kentucky](#).

**May 2000:** Prof. [Sudarshan S. Chawathe](#) received an NSF Career award. Congratulations!



# Oracle and Digital Libraries

---

## [Oracle 9i Database](#)

In 9i the interMedia Text component is Oracle Text.

---

## [Oracle interMedia](#)

Overview by Omar Alonso, Omar.Alonso@oracle.com, 650-607-3410:

Briefly, Oracle interMedia extends Oracle8i to manage rich content, including text, documents, image, audio, video, and geographic location, together with traditional business information.

interMedia is a standard feature of Oracle8i. It is included with every Oracle8i license, and provides content services to JDeveloper, Oracle Developer, iFS, WebDB, Oracle applications and Oracle partners.

Using interMedia services it is possible to . . .

- Use standard SQL to index and search text and documents stored in Oracle8i, in files and on the Web, including metadata associated with rich content, to provide retrieval capabilities fundamental to Web and other applications.
- Parse, index, and load rich content in Oracle8i and deploy to the Web with support for popular web page composition tools, web server technologies, and Web media formats (e.g., GIF, JPG, AU, WAV, MP3, QT, Real) delivered in either batch or streaming modes.
- Develop dynamic Web applications with rich media content using interMedia APIs for Java, C++ and PL/SQL.
- Tune Oracle8i based content repositories to achieve scalability and reliability superior to o.s. file based systems.

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Please send comments/suggestions to [Ed Fox](#).

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## Oracle9i

[Software](#)

[Documentation](#)

## Library

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[Internet DBA](#)

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[Oracle Magazine](#)



## Oracle9i Database

Oracle9i Database is the latest generation of the world's most popular RDBMS. Among the numerous new capabilities are unlimited scalability and industry-leading reliability with Oracle9i Real Application Clusters; new high availability technology including advancements in standby database technology (Oracle Data Guard); and built-in OLAP, data mining and ETL functions. Oracle9i Database includes over 400 additional new features that make this the most complete database in the industry.

### Technical Information

[PDF](#) **Oracle 9i -New Features Summary**

[PDF](#) **Oracle 9i -A Family of Database Products**

[HTML](#)

### Oracle9i Partner Accelerator Kit

A series of technical workshops highlighting the new features of Oracle9i. Topics include High Availability, Scalability, Security, Business Intelligence, Application Development, Portals, Content Management, Data Migration, with new topics published every month.

[PDF](#) **Oracle9i Replication - Technical White Paper**

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▶ [Workspace Manager](#)

▶ [Dynamic Services](#)

### Previous Release

▶ [Oracle8i database](#)



interMedia	Software	Documentation	Sample Code	Training	Support
------------	----------	---------------	-------------	----------	---------

Products
Internet Servers
Internet Tools
Business Tools
Applications
Technologies
Internet DBA
Software
Documentation
Sample Code
OTN-Xchange
Training
Support
Discussions
Consulting
OTN for Partners
Events

**Oracle *interMedia*** provides services to develop Web and wireless applications that include rich media managed in or through Oracle9i. It is integrated with JDeveloper and Oracle9iAS Portal for rapid development and deployment of multimedia applications.

*interMedia* is a standard feature of Oracle9i enabling it to manage rich content, including images, audio, and video information in an integrated fashion with other traditional business data.

### What can you do with *interMedia* Services?

- Parse, index, and store rich content
- Develop content rich Web applications
- Deploy rich content on the Web
- Tune Oracle9i content repositories

[More about \*interMedia\*](#)

interMedia Demos with...

[BC4J](#)

[Oracle9iAS Portal](#)

[Annotator](#)

**NEW!!**  
[Intel Solution Services White Paper: Oracle9i  
\*interMedia\*: wireless delivery of rich media content  
 and enterprise data](#)

### Technical Information

#### Quick Picks :

- ▶ [Oracle9i by Example - "Building Multimedia Applications Using BC4J"](#)
- ▶ [Parse, index, and store rich content](#)
- ▶ [Develop content rich Web apps](#)
- ▶ [Deploy rich content on the Web](#)
- ▶ [Partners](#)
- ▶ [RealServer Plugin](#)
- ▶ [Oracle9i Text](#)

#### What's New?

[Clipboard 2.1 with OraDAV Support](#)

[New Features for Oracle9i](#)

[interMedia BC4J Domain Classes](#)

[Relational Interface Kit](#)

[Media Developers Kit](#)

[Callable Annotation Services](#)

[Java Classes for Servlets & JSPs](#)

[JMF Classes Software](#)

[Web Access to \*interMedia\*](#)

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# Information Filtering Defined

A universally accepted definition of information filtering is, unfortunately, still lacking. So here is my personal definition, which I have used to build the Information Filtering Resources [web page](#). Generally, the goal of an information filtering system is to sort through large volumes of dynamically generated information and present to the user those which are likely to satisfy his or her information requirement.

In order to sharpen this definition, a distinction should be drawn between information collection and information filtering. In some domains (e.g. USENET News) the collection effort is minimal because the information comes to you. In other domains (e.g. the World Wide Web) the collection effort can be considerable because no mechanism exists to draw new information to the attention of a filtering system. The point to be made here, though, is that information collection is an interesting area in its own right, but I do not propose to include it in my definition of information filtering. In my view, the information filtering problem begins only after you have gained access to the new information.

Information filtering has been applied to a several domains using a variety of technical approaches. The original methods were manual alerting services that brought new information to the attention of users of research and special libraries. At the time this was referred to as Selective Dissemination of Information (SDI), a name which fell from favor about the time the Strategic Defense Initiative (SDI) was introduced in the United States :-). A few modern systems have adopted this remarkably descriptive name for the filtering process, however, and the interest in information filtering that has resulted from the present research thrusts in digital libraries arises at least in part from this tradition.

With the growth of the internet and other networked information, research in automatic filtering of networked information has exploded in recent years. Because of their low cost, large volume, and ease of recognizing new information, the most popular domains for research systems have been USENET News and electronic mail. The recent explosive growth of the World Wide Web has made this an interesting domain which has attracted some good research, although the information collection problem appears to make this a more difficult domain in which to conduct basic research on information filtering techniques. Another domain which has attracted considerable research interest is the annual Text REtrieval Conference (TREC) in which a standard text collection is used and a carefully controlled evaluation methodology is enforced. In TREC the information filtering task is referred to as "routing," adding somewhat to the confusion of terminology in this field. In fact, TREC recently adopted a special interest "filtering" track which adopts a different evaluation methodology but which conforms to the definition of filtering presented above. Commercial systems which filter newswire articles and other specialized information sources are becoming available as well. Filtering techniques will likely be applied to other domains such as images, sound and video in the future.

The distinction between information filtering and the more established field of information retrieval has proven to be the source of some confusion as well. Information retrieval broadly deals with the selection of information, and many of the features of information retrieval system design (e.g. representation,

# University of Maryland Information Filtering Project

The Information Filtering Project was a joint effort of the University of Maryland Electrical Engineering Department's [Medical Informatics and Computational Intelligence Laboratory](#), The Institute for Advanced Computer Studies' Computational Linguistics and Information Processing ([CLIP](#)) Lab and the College of Library and Information Services' [Digital Library Research Group](#), that extended from September 1993 through August 1996. Research on these topics is continuing, and information on the current work can be found [here](#).

## Our Web Pages

### [Information Filtering](#)

Links to what was at the time every known network-accessible resource on information filtering. New links are added as changes are noted, but this list is no longer comprehensive.

### [Cross-Language Text Retrieval](#)

Links to every known resource on cross-language text retrieval. Includes links to network accessible resources and a fairly comprehensive BibTeX file identifying published literature in the field. This page is still being maintained actively, and is fairly comprehensive.

## Papers and Talks

### [Alignment of Spanish and English TREC Topic Descriptions](#)

Poster paper presented at the Fifth Text REtrieval Conference (TREC-5), Gaithersburg MD, November 1996.

### [Evaluating Cross-Language Filtering Effectiveness](#)

Presented at the Cross-Linguistic Multilingual Information Retrieval Workshop at SIGIR-96, Zurich Switzerland, August 22, 1996.

### [Adaptive Vector Space Text Filtering for Monolingual and Cross-Language Applications](#)

A Ph.D. dissertation by Doug Oard that was completed in August 1996.

### [A Conceptual Framework for Text Filtering](#)

A selective survey of present practice in information filtering with an emphasis on defining the field and identifying significant research issues. The version linked above is HTML with links last verified in April 1997. The [postscript](#) version with the original URL's is also available. A greatly revised version will appear in the journal User Modeling and User Adapted Interaction in 1997.

### [A Survey of Multilingual Text Retrieval](#)

A survey of present practice in retrieval of texts in one language based on queries in another.

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# Cross-Language Information Retrieval Resources

This page is designed as a resource for people conducting research in [cross-language information retrieval](#). It is intended to collect references to all information on information retrieval systems which can accept queries in one language and return documents in another. It is maintained by the [Digital Library Research Group](#) of the [College of Information Studies](#) at the University of Maryland. If you are aware of resources that are within the scope of this page but do not appear here, please [send mail to Doug Oard](#).

## [December 1997 D-lib Magazine Article](#)

An introduction to cross-language information retrieval. A web page that was prepared for a [public lecture](#) here at Maryland provides another perspective on the topic.

## [Conferences](#)

An excellent source of information. This page includes links to the full proceedings of most major cross-language information retrieval workshops as well as to a fairly complete list of upcoming conferences and workshops that include some treatment of cross-language information retrieval.

## [Cross-Language Information Retrieval Papers and Project Descriptions](#)

Another excellent place to look for information. Here you will find descriptions of experimental work on cross-language text retrieval that may not have been presented at one of the major workshops

## [Working Systems](#)

Here you will find links to experimental and commercial cross-language information retrieval systems that you can either obtain or use over the net. Some carry a fairly hefty price tag, others are free.

## [Related Resource Pages](#)

Web pages which collect links to resources that may be of interest to cross-language information retrieval researchers. None of these pages are devoted solely to cross-language information retrieval.

---

Last modified: Fri Nov 24 21:40:29 2000

[Doug Oard](#) oard@glue.umd.edu



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Identify & Analyze

Organize & Classify

Search & Retrieve

Share & Collaborate

Application Developers

Information Consumers



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[30 informative articles](#)

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[Diplomatic relations](#)

[Theater/Film](#)

These links execute categorical and topical queries to an unattended collection of information that is refreshed daily by an automatic spidering process.

Would you like to get accurate information from the Internet or any digital files?

Would you like your information indexed according to the topics and issues that are significant to you?

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# CS5604 - Information Storage and Retrieval

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- [Status](#)
- [Syllabus](#)
- [Trips](#)
- **WWW Link Sets:** [Instructor's - CS4624: Multimedia, Hypertext and Information Access - WWW Virtual Library \(URLs organized by subject\)](#)

# Extended Boolean Queries and Retrieval

## Problems with Boolean

- A AND B AND C AND D AND E --- if miss one
  - get nothing, instead of those with 4, or later those with 3, etc.
  - don't have an easy way to reformulate for all the combinations
- A OR B OR C OR D OR E --- if have several
  - counts just like if only have one
  - don't have an easy way to show that prefer more than one occurrence
- A NOT B --- eliminates even casual use of term B
- No ranking
  - so users must fuss with retrieved set size, structural reformulation
  - so users must scan entire retrieved set
- No weights on query terms
  - so users cannot give more importance to some terms --- retrieval:2 AND system:1
  - so users cannot give more importance to some clauses --- retrieval:1 AND (MMM OR Paice):2
- No weights on document terms
  - so indexers are forced to make strict binary decisions --- forcing fewer index terms and lower recall
  - so no use can be made of importance of a term in a document --- if occurs frequently
  - so no use can be made of importance of a term in the collection --- if occurs rarely

## Fuzzy Set Theory

- Zadeh since 1965
- Studied here in EE
- Recently adopted in Japan: numerous patents: fuzzy controls, shower heads
- Start with notion of sets for : tall, small, large, bright, kind, ...
- Use range [0,1] instead of choice (0,1)
- Redefine AND as MIN
- Redefine OR as MAX
- Evaluate NOT B as  $1 - \text{value}(B)$

## Applying Fuzziness to IR

- If want Boolean laws to apply, must use MIN/MAX definitions.
- Can apply to automatic document indexing with term weight =



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[Plus Web Directory](#)

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[Radio Search](#)

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[Phrases](#)

[Proximity](#)

## INTRODUCTION

# A short and easy search engine tutorial

**Welcome to our free search engine tutorial, a short and easy guide to Web searching, search engines and directories. This little crash course will teach you how to explore the Net more efficiently.**



*By Per and Susanne Koch*

There are millions and millions of webpages out there. However, as most of us have troubles finding an old letter on our own computer, how can we find relevant information on this "global hard drive"? After all, this is the closest thing we get to a World Wide Anarchy.

Well, there are people out there trying to catalogue the Web for us. Furthermore, virtual robots are scurrying around, trying to map the vast expanses of Cyberspace. Although most of them can cover only a small part of the Net, the task of finding anything among some two billion pages is still daunting.

However, the main problem is not that the search engines and the search directories find too little, but that they find too much. It is hard to uncover the needle in a list of 40,000 hits. That's why Pandia brings you this short and easy search engine tutorial. To get the right answer, you must ask the right question. This Web search tutorial will tell you exactly how to do that!

It will take you approximately 30 minutes to read the search engine tutorial through, and you will learn the essentials of Web searching in less than an hour. By improving your searching skills you will be able to find what you are looking for faster and more efficiently. How is that for an investment?

# Web Thesaurus Compendium

*Quick access:*

[- thesauri alphabetical](#)

[- thesauri indexed by subject](#)

[- thesaurus-related literature and resources](#)



[- thesaurus-related research groups](#)



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Have a look at [Links2Go Thesauri Key Resources](#)

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## Introduction

The thesauri and classification schemes in this collection are all available on the web with various search and browse facilities, and various degrees of hypertext linking. "Search" means you can enter a term and search for it directly; "browse" means you can look through alphabetical or hierarchical lists. Several of the systems allow a search in data collections to be launched directly after finding the desired search terms in the thesaurus.

The term "thesaurus" is used loosely here to refer to any structured collection of interrelated terms; often, but not necessarily, in a certain domain.



In addition to the thesauri/classifications themselves, I also plan to include links to [thesaurus-building tools and software](#), to a selection of [academic literature on thesauri](#), and to some [research groups](#) doing related work. Check back in a few weeks for first drafts.

This is an ongoing list, by no means complete. If you have a thesaurus or other links for inclusion, please contact me ([Barbara Lutes](#)) at [lutes@darmstadt.gmd.de](mailto:lutes@darmstadt.gmd.de). For more information on work being done in the areas of multimedia information retrieval and digital libraries at our

# OAI

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- [Open Archives Initiative Home Page](#)
  - [OAI Pages at VT](#)
  - The Open Archives Initiative: Building a low-barrier interoperability framework. [9 page PDF version of article presented at JCDL 2001](#)
  - [Other Documents](#)
  - [Repository Explorer](#)
  - [Arc: Cross Archive Searching](#)
  - [Kepler](#)
  - [Survey of E-Prints archives](#)
- 

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Please send comments/suggestions to [Ed Fox](#).

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# Open Archives Initiative

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## News from the OAI Community

• **Digital Library Federation Encourages Use of Open Archives Initiative** The Digital Library Federation (DLF) is supporting the development of a small number of Internet gateways, which support the OAI Metadata Harvesting Protocol, through which users will access distributed digital library holdings as if they were part of a single uniform collection. More information at <http://www.diglib.org/architectures/testbed.htm>

• **Updated Repository Explorer** Hussein Suleman announces a beta version of [Hussein's Repository Explorer](#) that automatically tests for the new OAIMHP. Manual browsing works for both versions and will silently issue an Identify if that is not your first request.

• **NEW The Kepler Framework** Researchers at Old Dominion University, announce The Kepler framework, an "OAI Data/Service Provider for the Individual." The Kepler archivelet is available for Windows, Linux, and Unix Operating Systems. More information and download at <http://kepler.cs.odu.edu/>.

## Read Core Documents

- [Metadata Harvesting Protocol](#)
- [Frequently Asked Questions](#)

## Join the OAI Community

[OAI General list](#)

[OAI Implementers list](#)



as a data provider



a post to our web site

## Contact us:

[openarchives@openarchives.org](mailto:openarchives@openarchives.org)

Support for Open Archives Initiative activities comes from the Digital Library Federation, the Coalition for Networked Information, and from National Science Foundation Grant No. IIS-9817416





# Open Archives Initiative

## Virginia Tech DLRL Projects

- 
- [Introduction to the Open Archives Initiative](#)
  - [Virginia Tech's Involvement with the OAI](#)
  - [Projects](#)
  - [Reports, Presentations, and Demonstrations](#)
  - [Software](#)
  - [Links](#)
  - [People](#)
- 

## Introduction to the Open Archives Initiative

The [Open Archives Initiative](#) (OAI) is dedicated to solving problems of digital library interoperability. Its focus has been on defining simple protocols, most recently for the exchange of metadata from archives. The OAI evolved out of a need to increase access to scholarly publications by supporting the creation of interoperable digital libraries. As a first step towards such interoperability, a metadata harvesting protocol was developed to support the streaming of metadata from one repository to another, ultimately to a provider of user services such as browsing, searching, or annotation.

---

## Virginia Tech's Involvement in the OAI

# The Open Archives Initiative: Building a low-barrier interoperability framework

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## ABSTRACT

The Open Archives Initiative (OAI) develops and promotes interoperability solutions that aim to facilitate the efficient dissemination of content. The roots of the OAI lie in the E-Print community. Over the last year its focus has been extended to include all content providers. This paper describes the recent history of the OAI – its origins in promoting E-Prints, the broadening of its focus, the details of its technical standard for metadata harvesting, the applications of this standard, and future plans.

## Categories and Subject Descriptors

D.2.12 [Software Engineering]: Interoperability – *Interface definition languages*.

## General Terms

Experimentation, Standardization.

## Keywords

Metadata, Interoperability, Digital Libraries, Protocols.

## 1. INTRODUCTION

In October 1999, a meeting was held in Santa Fe to discuss mechanisms to encourage the development of E-Print solutions. The group at this meeting was united in the belief that the ubiquitous interconnectivity of the Web provides new opportunities for the timely dissemination of scholarly information. The well-known physics archive run by Paul Ginsparg at Los Alamos National Laboratory has already radically changed the publishing paradigm in its respective field. Similar efforts planned, or already underway, promise to extend these striking changes to other domains.

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JCDL '01, June 17-23, 2001, Roanoke, VA

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The result of this meeting was the formation of the Open Archives Initiative (OAI) and beginning of work on a framework facilitating the federation of content providers on the Web. Since that first meeting, the OAI has undergone a period of intensive development both organizationally and technically. The original focus on E-Prints has broadened to encompass content providers from many domains (with an emphasis on what could be classified “scholarly” publishing), a refined and extensively tested technical framework has been developed, and an organizational structure to support the Initiative has been established.

The name *Open Archives Initiative* reflects the origins of the OAI in the E-Prints community where the term *archive* is generally accepted as a synonym for a repository of scholarly papers. Members of the archiving profession have justifiably noted the strict definition of an “archive” within their domain; with implications for preservation of long-term value, statutory authorization and institutional policy. The OAI uses the term “archive” in a broader sense: as a repository for stored information. Language and terms are never unambiguous and uncontroversial and the OAI respectfully requests the indulgence of the archiving community with this less constrained use of “archive”.

Some explanation of the use of the term “Open” in OAI is also due. Our intention is “open” from the architectural perspective – defining and promoting machine interfaces that facilitate the availability of content from a variety of providers. Openness does not mean “free” or “unlimited” access to the information repositories that conform to the OAI technical framework. Such terms are often used too casually and ignore the fact that monetary cost is not the only type of restriction on use of information – any advocate of “free” information recognize that it is eminently reasonable to restrict denial of service attacks or defamatory misuse of information.

This paper documents the development of the Open Archives Initiative and describes the plans for the OAI for the near future. At the time of completion of this paper (May 2001), the OAI has released the technical specifications of its metadata harvesting protocol. The substantial interest in the OAI heretofore indicates that the approach advocated by the OAI – establishing a low-entry and well-defined interoperability framework applicable across domains – may be the appropriate catalyst for the federation of a broad cross-section of content providers. The coming year will indicate whether this is true and whether the technical framework defined by the metadata harvesting protocol



# Open Archives Initiative

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Find out the details for implementing the OAI Protocol, or read about the history of the OAI and its activities.

## ■ Essential Documents

- [Open Archives Initiative Protocol for Metadata Harvesting](#) - Version 1.1
- [Open Archives Initiative Frequently Asked Questions](#)

### Migrating from OAI 1.0 to OAI 1.1

[Migration instructions for data providers](#)

[Migration schedule](#)

- [The Open Archives Initiative: Building a low-barrier interoperability framework](#). JCDL 2001

## ■ OAI-Related Papers

## ■ Historical Documents

- [Santa Fe Convention](#)
- [Open Archives Initiative Meeting History](#)

Support for Open Archives Initiative activities comes from the Digital Library Federation, the Coalition for Networked Information, and from National Science Foundation Grant No. IIS-9817416





# Open Archives Initiative - Repository Explorer

*explorer version - 1.3 : protocol version - 1.0/1.1 : August 2001*

This site presents an interface to interactively test archives for compliance with the OAI Protocol for Metadata Harvesting [ [Click here for details](#) ]

JavaScript is required

Note: To avoid HTTP errors, please wait for each page to finish loading before clicking on any link.

---

Please enter the URL to the OAI interface (everything before the ?) or choose a predefined archive from the table

[ [View Archive Website](#) ][ [Test and Add an archive to this list](#) ]

Verbs	Parameters
<a href="#">Identify</a> <a href="#">List Metadata Formats</a> <a href="#">List Sets</a> <a href="#">List Identifiers</a> <a href="#">List Records</a> <a href="#">Get Record</a>	from (YYYY-MM-DD) : until (YYYY-MM-DD) : <a href="#">metadataPrefix</a> : identifier : set : resumptionToken :



---

[Simple search](#) [Advanced Search](#) [Help](#)

### Search all bibliographic fields

Search for

Sort results by

Group results by

Arc is an experimental research service of Digital Library Research group at Old Dominion University. Arc is used to investigate issues in harvesting OAI compliant repositories and making them accessible through a unified search interface. It is not a production service and may be subject to unscheduled service interruptions and anomalies.

*This prototype is based on the [UPS](#) project and the [NCSTRL+ based digital library](#) developed by [Old Dominion University](#)*



## Welcome to Kepler's Home Page

**Overview.** We extend the OAI framework to support what we call "personal data providers" or "archivelets".we have created a self-contained, self-installing software that allows the user to create and maintain a small, OAI-compliant archive - archivelet - easily. Though our software is written, we have three separate downloads as we have packaged Java Runtime Environment with our software for the three operating systems to keep our code standalone. To support discovery, we have created an [OAI-compliant service provider](#) that will harvest metadata from all existing archivelets and make them available to the general public.By using this software, users can publish their own personal archives on their personal computers and share others' published archives.

► [Technical Report](#)

► [Download Archivelet Versions](#)

► [Upgrading Archivelet](#)

► [Testing the newest Archivelet](#)

► [Kepler Service Provider](#)

► [Frequently Asked Questions](#)

► [Developer Site - Restricted](#)

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*Contact us:* [dlibug@cs.odu.edu](mailto:dlibug@cs.odu.edu)

[Home](#)[Information](#)[Documentation](#)[Download](#)[Mailing List](#)[EPrints 2...](#)[Bug Reports](#)[Links](#)[English](#)[Français](#)

# Archive User/NonUser Survey

The purpose of this survey is to determine who is and is not using Eprint archives at this time, how they use them if they do, why they do not use them if they do not, and what features they would like to have added to them to make them more useful. (The survey is anonymous. Revealing your identity is optional and it will be kept confidential.)

The survey consists of about web-based 75 questions, and comes in four versions.

**Below are links to the four versions of the survey (~72 questions). Please complete the one that is appropriate for you:**

---

## **PHYSICISTS, ASTROPHYSICISTS, MATHEMATICIANS, ETC:**

### **1. arXiv-users**

[Questionnaire for users of arXiv](#)

### **2. arXiv-non-users**

[Questionnaire for non-users of arXiv](#)

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**COGNITIVE SCIENTISTS (PSYCHOLOGY,  
NEUROSCIENCE, BEHAVIORAL BIOLOGY, COMPUTER SCIENCE  
[ARTIFICIAL INTELLIGENCE, ROBOTICS, NEURAL NETS,**



## Spiders are Us

+ research goal

+ funding

+ acknowledgements

+ approach /methodology

+ demonstrations

[GA Optimizer I and II](#)

[Internet Search Spider](#)

[BFS Spider](#)

[Itsy Bitsy Spider: GA Spider](#)

+ team members

+ publications

# Spiders are Us

research goal:

*To develop  
intelligent Internet  
agents to facilitate  
information retrieval  
from disparate sources.*



Tailong Ke © 1999

# PageRank: Bringing Order to the Web

**[Click here to start](#)**

## **Table of Contents**

**Author:** Larry Page

PageRank: Bringing Order to the Web

**Email:** [page@cs.stanford.edu](mailto:page@cs.stanford.edu)

Overview

**Home Page:** <http://www-pcd.stanford.edu/~page/>

PageRank: A Citation Importance Ranking

PageRank: A Citation Importance Ranking

PageRank is a Usage Simulation

Idealized PageRank Calculation

Idealized Model

Idealized Computation

But...

Actual PageRank Calculation

Actual PageRank Model

PageRank Calculation

Under Specified Queries

Initial Implementation

Search: University

## 5. Research in Fusion

“Two heads are better than one” is the basic premise of fusion. The bulk of IR fusion research, which investigates the various ways of combining different retrieval strategies, have found fusion to have a positive effect on retrieval performance regardless of what strategies were combined. Furthermore, some researchers observed that the inclusion of a “weak” component into the fusion pot still resulted in strong performance gain, which suggested the possibility that fusion could produce the whole greater than the sum of its parts. The potential of fusion to leverage the strengths of its components while minimizing their weaknesses is not only promising in its own right, but offers a novel perspective of IR that relaxes the research goal of discovering the one best retrieval strategy.

Discovering the “best” way to find information, especially in the Web, is difficult, if not impossible. Since we have yet to discover a “unified theory of IR”, we may benefit most from investigating the best way to combine existing strategies. It may turn out that the nature of IR is much like that of beauty as stated by Francis Bacon: “There is no excellent beauty which hath not some strangeness in the proportion.” If so, the “strangeness” of individual IR approaches could be a necessary condition for its contribution to the “excellence” of the combined approach. In other words, the micro-optimization, where the strength of a given approach might be compromised to lessen the adverse effects of its weakness in order to achieve the optimal performance level, may not be as rewarding as the macro-optimization approach of fusion, where the unmitigated strengths of various approaches are combined in a complementary way to produce the whole greater than the sum of its parts.

Of course, realizing the potential of fusion is easier said than done. In addition to the challenge of optimization, the fundamental assumptions of fusion argue against the singular approach, thus confounding the problem space. Instead of approaching fusion as a “hall of mirrors” problem, however, we may do well to consider fusion as a philosophy of dynamic solution space, where different combinations of fusion components address different points in the problem space. As Belkin et al. (1993) points out, “there may be some optimum order of combination, or there may be some optimum weighting of sources of evidence” for any given situation in IR. For instance, the fusion strategy of combining multiple evidences about a single document collection may be different from that of combining the retrieval results from multiple collections or that of combining

# Multimedia, Representations:

---

## The Basics:

- [text file formats](#)
- [graphic file formats](#)
- [hypermedia & multimedia](#)

ACM DL'97 Tutorial: [Multimedia Information and Systems](#)

[ACM SIG on Information Retrieval](#) ; [ACM SIG on Multimedia](#) ; [IEEE-CS TC on Multimedia Computing](#) ; [Computing Curricula 2001](#)

## Digital Video

- [KRDL: Seamless Integration of Video Contents for Web-based Presentations over Different Devices](#)
- [KRDL: Video to SlideShow System \(ViSS\)](#)
- [CNN uses Quicktime for WWW daily news clips](#)
- [Digital Video Resources on Internet](#)

## MHIA Courseware and Curricula

- [Curriculum Resources in Interactive Multimedia \(CRIM\) Home Page](#)
- [MHIA Home Page](#)
- [SIGIR 96 Workshop](#)
- [Drexel 96 Workshop](#)
- [IR Courses](#)
- [Multimedia Courses](#) (Dublin, Ireland)
- [MM 1996 Workshop](#)
- [Lisbon 1997 Workshop](#)
- Questions:
  - What is the need for education related to information? What jobs?
  - What subjects should be covered in such education programs?
  - How should those subjects be ordered into each specific program?

# Digital Video

- [Educom 97 Panel on Campus Network Digital Video](#) - includes excellent overviews of technology and resources.
- [Video in Educational Research](#) - A starter kit for investigators of learning, includes digital and analog video
- [CD Info](#) - info about CD-ROM and DVD (DVD-R, DVD-ROM)
- [CNN Video Vault](#)
- [Codec Central](#) - source of information on multimedia codecs and technologies
- [Digital Video Product Sites](#)
- [DV Toolkit](#) - digital video information, links and compression resources from DV Magazine
- [DVD Info](#)
- [DVD Resources](#) (Digital Versatile Disk)
- [DVD Frequently Asked Questions](#)
- [Fractal Movie Archive](#)
- [Guide to Digital Video](#) - overview on various aspects of digital video, including video capture, codecs, MPEG, AVI, Quicktime and more
- [MPEG Pointers and Resources](#)
- [MovieStar](#) - QuickTime Movie making software and web plug ins
- [Footage.Net](#) - Online Clearance house for Stock footage including QT versions
- [BBC Stock Footage](#) - the world's largest stock film footage archive
- [NET TOOB Multimedia Player for Windows](#) - plays all of the digital video formats found on the Internet
- [QuickTime](#) - from Apple Computer
- [Getting Started with QuickTime 3](#)
- [QuickTime Plug-in Sample Web Site](#) - good examples of QT and QTVR
- [QuickTime FAQ](#)
- [Radius Digital Video Information Server](#) - good information on creating digital video
- [Thant's Animation Index](#)
- [Terran Interactive](#) - introduces Movie Cleaner Pro, the long-awaited replacement for MovieShop.
- [VDOLive](#) - real-time video over the internet
- [Video laserdisc technology](#) - University of Iowa
- [Video Servers: Live from your network](#) - an excellent review and comparison of high/low end digital video server products.

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## Home site of the JPEG and JBIG committees

Latest -- [More details and papers about the forthcoming JPEG2000 standards!](#)

This site is used for document distribution and discussion by the international JPEG and JBIG groups, who represent a wide variety of companies and academic institutions worldwide. They meet at least three times a year to discuss and create the standards for still image compression.

This site has links to many other sites containing content of interest and relevance to the JPEG and JBIG communities. It also holds links to a [JPEG public relations](#) site, and one dealing with the [registration of information and other data](#) in accordance with standards produced by the groups.

The links should be of general interest to the still imaging community - if you want to suggest we include further links to your site, please email the [Webmaster](#).

To participate in the work of the JPEG and JBIG committees, or to have access to all the information the site contains about new initiatives such as JPEG2000, you must be a member of the committee, or of a body which has 'liaison' status with us. Initially, you should contact your national standards body, and ask them about how you can help in the work of the 'ISO SC29/WG1' committee (to give JPEG and JBIG their proper title). We always welcome active new participants to our standards process.

Welcome to our site - enjoy....

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Comments and corrections to to [the Webmaster](#).



# MPEG Pointers and Resources

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The logo for Pixel Tools, featuring a large, stylized blue 'P' followed by the text "IXEL TOOLS" in a black, serif font.

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## The Reference Website for MPEG!

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[What is MPEG.ORG ?](#)

[Play MPEG now!](#)

[Site Overview](#)

[Site Awards and Reviews](#)

[Credits](#)



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#### CATCH THE ACTION





Interaction



# Synchronized Multimedia

[What's New ?](#) | [The Specification](#) | [Getting Help](#) | [SMIL Players](#) | [SMIL Authoring Tools](#) | [Background](#) | [Accessibility](#) | [History](#) | [Mailing list archive.](#)

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## SMIL<sup>TM</sup>

The Synchronized Multimedia Integration Language (SMIL, pronounced "smile") enables simple authoring of interactive audiovisual presentations. SMIL is typically used for "rich media"/multimedia presentations which integrate streaming audio and video with images, text or any other media type. SMIL is an easy-to-learn HTML-like language, and many SMIL presentations are written using a simple text-editor.

For a more detailed description of the goals of the SMIL language, see the [W3C Activity Statement](#) on Synchronized Multimedia; a regularly updated report to W3C members that is also available to the public..

## What's New ?

1. Aug 2001: [SMIL 2.0](#) becomes a W3C Recommendation ([Press Release](#), [Testimonials](#), [Implementation Report](#) - see also "[What's new in SMIL 2.0 ?](#)")
2. Aug 2001: [Talkshow on SMIL 2.0](#) (streaming audio) by [streamingmedia.com](#)
3. Aug 2001: [SMIL/XHTML+SMIL](#) converter by [INRIA](#)
4. Aug 2001: "[Streaming: Past, Present and Future - An Investigation into the Synchronized Multimedia Integration Language 2.0 \(SMIL 2.0\)](#)" M. Sc. Thesis by Asa Viken
5. July 2001: [Internet Explorer 6.0 Public Preview](#) by [Microsoft](#) supports many of the SMIL 2.0 modules including Timing and Synchronization, BasicAnimation, SplineAnimation, BasicMedia, MediaClipping, and BasicContentControl.

# Architectures:

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Core topics include:

- [D-Lib article on architecture](#)
- [Other CNRI activities](#)
- **Naming**
  - [PURL](#)
  - [Handles](#)
- [Networks](#): online notes of Dr. Lesk

Other topics of general interest, that are being studied by the [D-Lib Metrics Group](#) include:

- **Distributed processing (client/server)**
- **Interoperability** (see [IITA workshop on Interoperability](#) and some of work at [Stanford](#), [EU](#), as well as the [Open Archives Initiative](#))
- **Performance**
- [Agent-Based Architecture](#), W. Birmingham, D-Lib Magazine, July 1995

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# Key Concepts in the Architecture of the Digital Library

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Corporation for National Research Initiatives  
Reston, Virginia  
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**D-Lib Magazine**, July 1995

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## Introduction

For the past two years, the Computer Science Technical Reports project (CS-TR) has been developing an architecture for a digital library with funding from the Department of Defense's Advanced Research Projects Agency (ARPA). This is a general purpose framework for a digital library in which very large numbers of objects, comprising all types of material, are accessible over national computer networks. It is described in a paper by Robert Kahn and Robert Wilensky (cnri.dlib/tn95-01).

This architecture has been the subject of a series of useful discussions from which eight general principles have emerged; they are discussed in this introduction. These principles form the key issues in the transition to a true digital library from the network services that we have today. The Kahn/Wilensky paper also contains a comprehensive framework for resolving these issues.

## General Principles

- [1. The technical framework exists within a legal and social framework](#)
- [2. Understanding of digital library concepts is hampered by terminology](#)
- [3. The underlying architecture should be separate from the content stored in the library](#)
- [4. Names and identifiers are the basic building block for the digital library](#)
- [5. Digital library objects are more than collections of bits](#)
- [6. The digital library object that is used is different from the stored object](#)
- [7. Repositories must look after the information they hold](#)

# CNRI:

---

- home page (site map) [http://www.cnri.reston.va.us/site\\_map.html](http://www.cnri.reston.va.us/site_map.html)
- Architecture
  - Kahn-Wilensky Framework for Distributed Digital Object Services\_  
<http://WWW.CNRI.Reston.VA.US/home/cstr/arch/k-w.html>
  - key architectural issues  
(1996)<http://WWW.CNRI.Reston.VA.US/home/cstr/arch/slides.html>
  - architecture for information in digital libraries  
<http://www.dlib.org/dlib/february97/cnri/02arms1.html>
  - Digital Object Architecture Project <http://www.cnri.reston.va.us/doa.html>
- Handle System (<http://www.handle.net/>) and Digital Object Identifier System  
(<http://www.doi.org/>)
- CS-TR Computer Science Technical Reports <http://www.cnri.reston.va.us/cstr.html>

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Please send comments/suggestions to [Ed Fox](#).

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# A Framework for Distributed Digital Object Services

Robert Kahn  
Corporation for National Research Initiatives

Robert Wilensky  
University of California at Berkeley

May 13, 1995  
cnri.dlib/tn95-01

## 1. Introduction

This document describes fundamental aspects of an infrastructure that is open in its architecture and which supports a large and extensible class of distributed digital information services. Digital libraries are one example of such services; numerous other examples of such services may be found in emerging electronic commerce applications. Here we define basic entities to be found in such a system, in which information in the form of **digital objects** is stored, accessed, disseminated and managed. We provide naming conventions for identifying and locating digital objects, describe a service for using object names to locate and disseminate objects, and provide elements of an access protocol.

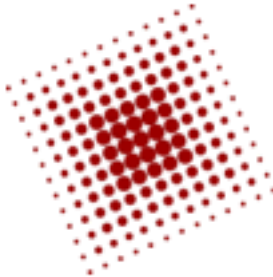
We use the term **digital object** here in a technical sense, to be defined precisely below. Files, databases and so forth that one may ordinarily think of as objects with a digital existence are not digital objects in the sense used here, at least not until they are made into an appropriate data structure, etc., as we will describe shortly.

Only the most basic elements of the infrastructure are described herein. These elements are intended to constitute a minimal set of requirements and services that must be in place to effect the infrastructure of a universal, open, wide-area digital information infrastructure system ("the System"). We anticipate that many other services and elaborations will come into existence as the System is further developed, either building upon or otherwise added to these elements.

This paper focuses on the network-based aspects of the infrastructure, namely those for which knowledge of the contents of digital objects is not required. Definition of the content-based aspects of the infrastructure is purposely not addressed in this paper. An important goal in limiting the description of the infrastructure in this way is not to constrain the higher level user and service level choices that, for many reasons, might be inappropriate to fix upon at this point in time. With only the most basic elements of the infrastructure in place, technological evolution would not be overly constrained. Further, the

**This page is part of the archive  
of a research project that ended in 1996.  
Information on this page is likely to be out-of-date and  
external links may not be correct.**

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The Corporation for  
National Research Initiatives

# Key Architectural Issues in The Digital Library

William Y. Arms

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## Acknowledgments

- This is work in progress.
  - This is a personal interpretation of ideas developed by the CSTR Project.
  - CSTR is a joint project of CNRI with Carnegie Mellon, Cornell, MIT, Stanford and UC Berkeley, funded by ARPA.
  - For background information, see the [CSTR home page](#).
  - The architecture is more fully described in a [paper by Robert Kahn and Robert Wilensky](#).
- 

## Key Issues and CSTR Terminology

This set of WWW pages looks at the following six key issues in the architecture of the digital library.

- Items in the library - [digital object](#).
- Identifiers - [handle](#).
- Storage - [repository](#).
- Sets of objects - [composite and meta-object](#).

# An Architecture for Information in Digital Libraries

William Y. Arms  
Christophe Blanchi  
Edward A. Overly  
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Reston, Virginia  
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**D-Lib Magazine**, February 1997

ISSN 1082-9873

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### [2. Overview of the Digital Library System](#)

### [3. The Information Architecture](#)

#### [3.1 Outline of the Information Architecture](#)

#### [3.2 An Example of the Use of Meta-objects](#)

### [4. Next Steps](#)

### [5. Technical Information](#)

#### [5.1 Digital Objects](#)

#### [5.2 Handles and the Handle System](#)

#### [5.3 The Repository](#)

#### [5.4 User Interfaces](#)

### [6. References](#)

### [7. Acknowledgments](#)



# The Digital Object Identifier System

*Developed by the International DOI Foundation*

[Home](#)

[System Description](#)

[DOI Foundation](#)

[Handbook](#)

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[Application Profile](#)

[Registration Agency](#)

[FAQ](#)

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[Related Articles](#)

[Join the IDF](#)

[Request a Prefix](#)

[Admin Forms](#)

[Members Only](#)

★ [Sharing Information: Building Global Infrastructure for the Media Industries](#) ★

★ [DOI System Milestone Achieved: Freeware Tools for Intellectual Property Management](#) ★

★ [IDF Funds Study](#) ★  
[Multimedia Intellectual Property Rights](#)

The Digital Object Identifier (DOI®) is a system for identifying and exchanging intellectual property in the digital environment. It provides a framework for managing intellectual content, for linking customers with content suppliers, for facilitating electronic commerce, and enabling automated copyright management for all types of media. Using DOIs makes managing intellectual property in a networked environment much easier and more convenient, and allows the construction of automated services and transactions for e-commerce.

[Join the International DOI Foundation!](#)

[Become a Registration Agency!](#)

[Request an Information Kit!](#)

[Subscribe to DOI News to receive monthly announcements!](#)

## Don't Miss

[DOI Handbook](#), Version 1, February 2001.

The comprehensive guide to the DOI System.

"Overview of the DOI System" ([English](#), [Español](#) or [Deutsch](#))

"DOI System Overview Slides" ([English](#), [Español](#) or [Deutsch](#))

★ [View the demonstration of multiple resolution for eBooks](#) given at Book Expo America.

## Recent Press Coverage

Read what international [magazines, newspapers and reports](#) are saying about the DOI.

Subscribe to a DOI [Mail List](#).

Do you browse the Web with a [handheld device](#)?

## Key Resources

[The DOI Handbook](#) - information on all aspects of the DOI and the DOI System (New Version 1.0.0 released 22 Feb 01) and [Overview of the DOI System - summary of the DOI System and introduction to the Handbook](#).



[indecS Framework](#) - A reference model metadata framework.



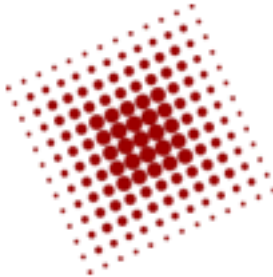
[The Handle System](#) - The underlying infrastructure for DOIs.



[Download](#) the DOI logo.

**This page is part of the archive  
of a research project that ended in 1996.**  
**Information on this page is likely to be out-of-date and  
external links may not be correct.**

---



The Corporation for  
National Research Initiatives

# CS-TR

## Computer Science Technical Reports

- [An Introduction to the CS-TR Project](#), Robert E. Kahn, December 11, 1995
  - [Participants](#)
  - [Architecture of the Digital Library](#)
  - [Implementations](#)
  - [Contributed technology](#)
- 

## Participants

Each participant has provided on-line information about their work.

- [Carnegie Mellon University](#)
  - [Cornell University](#)
  - [University of California at Berkeley](#)
  - [Stanford University](#)
  - [Massachusetts Institute of Technology](#)
  - [CNRI](#)
-



# Stanford University Digital Libraries Project

## Using the InfoBus

The Stanford Digital Libraries project is a participant on the Digital Library Initiative started in 1994 and supported by [NSF](#), [DARPA](#), and [NASA](#), with Stanford focusing on **interoperability**.

At the heart of the project at Stanford is the testbed running the **InfoBus** protocol which provides a uniform way to access a variety of services and information sources through proxies acting as interpreters between the InfoBus protocol (**DLIOP**) and the native source protocol.

What follows is a list of selected web pages containing useful information and tutorials about InfoBus, its protocol and related projects.

- A brief introduction to [INFOBUS](#) and related projects in Stanford.
- This [page](#) contains a postscript file with a tutorial of the INFOBUS architecture and its protocol (DLIOP). This tutorial gives you the main concepts of INFOBUS and it is a brief introduction to programmers who want to use INFOBUS.
- The Stanford [Metadata architecture](#)

If you want more information, you can take a look to these web pages:

- INFOBUS home page: <http://www-diglib.stanford.edu>
- List of INFOBUS related projects: <http://www-diglib.stanford.edu/diglib/pub/projects.shtml>
- DLIOP (the INFOBUS protocol): <http://www-diglib.stanford.edu/~testbed/interchange>
- The Metadata Architecture: <http://www-diglib.stanford.edu/diglib/pub/delos.html>
- The INFOBUS GUI (DLITE): <http://dlite.stanford.edu>

That's all. If you have any questions or comments, please contact Andreas Paepcke ([paepcke@cs.stanford.edu](mailto:paepcke@cs.stanford.edu))

# Interfaces:

---

## [Stanford DL user interface projects](#)

### **Xerox Interfaces for Information Access**

- [Home Page](#)
- [Scientific American article](#)
- [Cat-a-Cone figures](#)
- [Scatter/Gather examples](#)
- Questions:
  - Compare
    - What are the various interfaces built? How do they compare? What is the best use of each?
  - Scatter/gather
    - Explain clustering, relate it to scatter/gather.
    - What are special problems with large category systems and how can they be solved?

[Envision](#) project at Virginia Tech, [MARIAN](#) sequel

[Berkeley](#): TileBars, Multivalent documents

---

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---

Please send comments/suggestions to [Ed Fox](#).

**(c) Copyright 1998-2001, Edward A. Fox, Rajat Gupta**

# Cat-a-Cone: An Interactive Interface for Specifying Searches and Viewing Retrieval Results using a Large Category Hierarchy

Marti A. Hearst  
Xerox PARC  
3333 Coyote Hill Rd  
Palo Alto, CA 94304  
hearst@parc.xerox.com

Chandu Karadi  
School of Medicine, M121  
Stanford University  
Stanford, CA 94305  
karadi@leland.stanford.edu

**This paper appears in the proceedings of 20th Annual International ACM/SIGIR Conference, Philadelphia, PA, July 1997.**

**An unpublished [Appendix](#) to this paper contains additional figures which were omitted from the proceedings due to space limitations.**

## Abstract:

This paper introduces a novel user interface that integrates search and browsing of very large category hierarchies with their associated text collections. A key component is the separate but simultaneous display of the representations of the categories and the retrieved documents. Another key component is the display of *multiple* selected categories simultaneously, complete with their hierarchical context. The prototype implementation uses animation and a three-dimensional graphical workspace to accommodate the category hierarchy and to store intermediate search results. Query specification in this 3D environment is accomplished via a novel method for painting Boolean queries over a combination of category labels and free text. Examples are shown on a collection of medical text.

In the *Proceedings of the Twentieth Annual International ACM SIGIR Conference*, Philadelphia, PA, July 1997, to appear.

[© Copyright 1997 by ACM, Inc.](#)

## INTRODUCTION



# MARIAN Digital Library Information System

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MARIAN is an indexing, search, and retrieval system optimized for digital libraries. It was developed at the Virginia Tech Computing Center for VT Information Systems, with development continuing at the DLRL.

---

## Running Systems



MARIAN / VT  
Library.

MARIAN v.1.5 running as an online public access catalog system for the VT Library collection.

MARIAN v.2.0 running on a union of two collections from the ND LTD.



MARIAN / ND LTD.



MARIAN v.2.2 running on the ND LTD sample.  
**EXPERIMENTAL**  
Experimental.

# Metadata:

---

- [IMS Metadata](#)
- [Metadata: the Foundations of Resource Description](#)
- [OCLC/NCSA Metadata Workshop Report](#)
- [OAI](#)
- [RFC-1807](#)
- [TEI](#)
- [BASIS article](#)
- [D-Lib Working Group on Metadata](#)
- [STARTS](#)
- [Dublin Core Metadata Initiative](#) (and [NISO standards effort](#))
- [Alliance Metadata Standards Working Group at NCSA](#)

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---

Please send comments/suggestions to [Ed Fox](#).

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## IMS Learning Resource Meta-data Specification

Version 1.2 Final Specification of the IMS Meta-data Specification was released to the public in June 2001. The IMS Technical Board approved changes are noted in each document.

The IMS Meta-data Specification is comprised of 3 documents. Links are provided below to the relevant materials as html and PDF files.

- ▶ [Version 1.2](#)
- ▶ [XML Bindings, DTDs and Examples \(v1p2\)](#)
- ▶ [RDF Bindings](#)
- ▶ [Version 1.1](#)
- ▶ [Version 1.0](#)
- ▶ [XML Bindings, DTDs and Examples](#)
- ▶ [Download Documents and Examples](#)
- ▶ [Frequently Asked Questions](#)
- ▶ [Send Comments or Questions](#)

### Version 1.2 - Final Specification - HTML

- [IMS Learning Resource Meta-data Information Model](#)
- [IMS Learning Resource Meta-data XML Binding Specification](#)
- [IMS Learning Resource Meta-data Best Practices and Implementation Guide](#)

### Version 1.2 - Final Specification - PDF

[Download all three PDF documents](#)

### IMS XML Bindings, DTDs, and Examples

- [imsmd\\_rootv1p2.dtd](#)
- [imsmd\\_rootv1p2.xsd](#)
- [ims\\_xml.xsd](#)
- [cancore\\_ex1.xml](#)
- [cancore\\_ex2.xml](#)
- [Download Sample Files](#)

---

Version 1.1 of the IMS Meta-data Specification was released to the public in June 2000. The IMS Technical Board approved changes are noted in each document.

The IMS Meta-data Specification is comprised of 3 documents. Links are provided below to the relevant materials as html and PDF files.

### Version 1.1 - Final Specification - HTML

- [IMS Learning Resource Meta-data Information Model](#)
- [IMS Learning Resource Meta-data XML Binding Specification](#)
- [IMS Learning Resource Meta-data Best Practices and Implementation Guide](#)

### Version 1.1 - Final Specification - PDF

[Download all three PDF documents](#)

# Metadata: The Foundations of Resource Description

Stuart Weibel

Office of Research, OCLC Online Computer Library Center, Inc.

*weibel@oclc.org*

**D-Lib Magazine**, July 1995

---

This paper is an abbreviated version of the [Summary Report of the OCLC/NCSA Metadata Workshop](#). It sets forth a proposal for the content of a simple resource description record (the Dublin Core Metadata Element Set) and outlines a series of further steps to advance the standards for the description of networked information resources.

- [Introduction](#)
- [Underlying Assumptions](#)
- [Implementations](#)
- [Next Steps](#)
- [References](#)

---

The logo for the d-lib forum, featuring the text "d-lib forum" in a stylized font. The "d-lib" part is in a bold, blue, sans-serif font, and "forum" is in a smaller, black, sans-serif font. The entire logo is set against a black background with a red horizontal line above and below it.The logo for d-lib magazine, featuring the text "d-lib magazine" in a stylized font. The "d-lib" part is in a bold, blue, sans-serif font, and "magazine" is in a smaller, black, sans-serif font. The entire logo is set against a black background with a red horizontal line above and below it.

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## Introduction

The explosive growth of interest in the Internet in recent years has created a digital extension of the academic research library for certain kinds of materials. Valuable collections of texts, images and sounds from many scholarly communities -- collections that may even be the subject of state-of-the-art

Network Working Group  
Request For Comments: 1807  
Obsoletes: [1357](#)  
Category: Informational

R. Lasher  
Stanford  
D. Cohen  
Myricom  
June 1995

*Page 1*

## A Format for Bibliographic Records

### Status of this Memo

This memo provides information for the Internet community. This memo does not specify an Internet standard of any kind. Distribution of this memo is unlimited.

### Abstract

This RFC defines a format for bibliographic records describing technical reports. This format is used by the Cornell University Dienst protocol and the Stanford University SIFT system. The original RFC ([RFC 1357](#)) was written by D. Cohen, ISI, July 1992. This is a revision of [RFC 1357](#). New fields include handle, other\_access, keyword, and withdraw.

### Introduction

Many universities and other R&D organizations routinely announce new technical reports by mailing (via the postal services) the bibliographic records of these reports.

These mailings have non-trivial cost and delay. In addition, their recipients cannot conveniently file them, electronically, for later retrieval and searches.

Publishing organizations that wish to use e-mail or file transfer to obtain these announcements can do so by using the following format.

Organizations may automate to any degree (or not at all) both the creation of these records (about their own publications) and the handling of the records received from other organizations.

This format is designed to be simple, for people and for machines, to be easy to read ("human readable") and create without any special programs.

This RFC defines the format of bibliographic records, not how to process them.

---

*Page 2*



electronic text center

Introduction to TEI

# TEI Guidelines for Electronic Text Encoding and Interchange (P3)

Made available by the Electronic Text Center at the University of Virginia



**[Search the entire \*TEI Guidelines\*](#)**



New! [Quick Tag Usage Look-up:](#)

search the *Alphabetical Reference List of Tags and Attributes* **only**



**Browse the *TEI Guidelines***

- [Bibliographic header of the TEI Guidelines](#)
- [Preface](#)
- [Acknowledgments](#)
  - TEI Working Committees (1990-1993)
  - Advisory Board
  - Steering Committee Membership
- [Changes from TEI P1 to TEI P3](#)
- [Part 1: Introduction](#)
- [Part 2: Core Tags and General Rules](#)
- [Part 3: Base Tag Sets](#)
- [Part 4: Additional Tag Sets](#)
- [Part 5: Auxiliary Document Types](#)

# Notes on Metadata and the Web

For an overview paper on related areas, read about the [Warwick Framework](#), a container architecture for aggregating metadata.

These notes are based on the articles that appear in the Oct./Nov. 1997 issue (v. 24 no. 1) of the *Bulletin of the American Society for Information Science* (ASIS). The issue title is *Organizing Internet Resources: Metadata and the Web*.

Some of the key topics considered are:

- Dublin Core, its evolution, its adaptations
- Cataloging, MARC, and their extension to Internet
- Automatic classification: Scorpion
- Naming: URL, URN, URI, URC, DOI

## Useful Links by Topic - Alphabetical

The following links are either taken from the articles in the *Bulletin* issue or relate closely and fill in helpful information.

- [InterCat Project](#)- proof-of-concept database, made of records extracted from OCLC's WorldCat, demonstrating catalog services plus Web access to resources of the Internet
- [International Conf. on Principles and Future Development of AACR](#)- related papers, on Anglo-American Cataloging Rules, and their revision
- [Persistent URLs](#)- PURLs
- [Dublin Core Home Page](#)
- [Dublin Core Elements](#)
- [Dublin Core element Coverage](#) - proposed standard
- [Center for Electronic Text in the Humanities](#)
- [EAD \(Encoded Archival Description\): SGML for Archival Finding Aids - LoC](#)
- [EAD \(Encoded Archival Description\): SGML for Archival Finding Aids - Berkeley](#)
- [UC Berkeley Finding Aids](#)
- [Cataloging Internet Resources: Manual and Practical Guide, by Nancy B. Olson](#)
- [RDF Home Page](#)- Resource Description Framework, on metadata architecture on the Web
- [UKOLN Metadata Home Page](#)- summary of pubs, projects, metadata resources from UK and beyond, definitions
- [metadata element sets crosswalks](#)- mappings and relationships between various metadata sets, including Dublin Core
- [OCLC](#) and its [Research Department](#)

# D-Lib Working Group on Metadata to Describe Information in Digital Libraries

**Joint Chairs: Michael F. Goodchild, Terence R. Smith, University of California, Santa Barbara**

If sense is to be made of the flood of information that will be available through digital libraries, it must be described effectively, so that it can be found, its value assessed, and its acquisition handled efficiently. Metadata is the term most often used to refer to the description of information objects to support these three functions of digital libraries. Digital library technology is capable of both supporting major augmentations to traditional metadata activities and providing a basis for catalog interoperability.

D-Lib is associated with two activities in this field. Both focus on the process by which creators of digital information can add metadata to their work at the time of creation. This metadata is then available for computer programs to use in building indexes and other access tools. It is also available as a basis for subsequent cataloging or the creation of secondary information services.

The first of these activities comes out of the [Alexandria Digital Library](#) project at the University of California, Santa Barbara. This project concentrates on geospatial information, such as maps, but its studies of metadata are broad based and applicable to all types of on-line data. Alexandria is one of the projects in the ARPA/NSF/NASA Digital Library Initiative (DLI) and its metadata studies involve members of several of the other DLI projects.

The second activity is the [Metadata I](#) and Metadata II invited workshop series. The first of these was sponsored by OCLC and NCSA in March 1995, chaired by Stuart Weibel of OCLC. Its major contribution was the "Dublin Core" metadata elements. D-Lib has agreed to be a sponsor of subsequent workshops.

These two activities are inter-related. In particular, Alexandria is using the Dublin Core as a building block for its own developments.

---

[Home](#) [W Groups](#)

---



# Dublin Core Metadata Initiative

*Making it easier to find information.*

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[Usage Board](#)
[Usage Guide](#)

## MIRRORS

[Australia](#)

(hosted by National Library of Australia)

[United Kingdom](#)

(hosted by UKOLN)



## DC-2001: International Conference on Dublin Core and Metadata Applications

October 22 - 26, 2001 - Tokyo, Japan

The Dublin Core Metadata Initiative is an open forum engaged in the development of interoperable online metadata standards that support a broad range of purposes and business models. DCMI's activities include consensus-driven working groups, global workshops, conferences, standards liaison, and educational efforts to promote widespread acceptance of metadata standards and practices.

### **New Document**

[New Working Draft of a Library Application Profile is now available](#)

2001-08-09, This document proposes a possible application profile that clarifies the use of the Dublin Core Metadata Element Set in libraries and library-related applications and projects. It will be discussed at a meeting of the DC-Libraries Working Group in Boston, Massachusetts on 22 August in conjunction with the IFLA conference. [More Information...](#)

### **New Project**

[ExLibris Special Collections Directory](#)

2001-08-04, The ExLibris Special Collections Directory seeks to provide a comprehensive directory of special collections libraries that support digitization and make content such as manuscripts, art images, and electronic texts available over the Internet.

### **General Announcements**

New issue of the DCMI Update Newsletter now available

2001-08-03, The [DCMI Update newsletter, July 2001](#), is now available. The newsletter highlights news items, project and tool announcements that have occurred since the last issue.

### **General Announcements**

Catalan translations of the Element set and Qualifiers are now available

2001-07-27, The [Biblioteca de Catalunya](#) has translated the [Dublin](#)

## WORK IN PROGRESS

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 ISO TC 46/SC 4

# NISO Standards Committees

## Dublin Core Metadata Element Set (Committee AS)

Chair: John Kunze, email: [jak@nlm.nih.gov](mailto:jak@nlm.nih.gov)

### Description of Standard:

A basic set of metadata for resource discovery.

### Status of the work:

[Balloting was completed on August 15, 2000.](#) The committee is reviewing responses and comments on the Dublin Core Metadata Element Set standard.

---

### Charge to NISO Standards Committee AS:

Standards Committee AS is charged with managing the progress of the Dublin Core Metadata Element Set through the process of becoming an American National Standard using the NISO Fast Track procedures. Fully formed documents on Fast Track processing must be approved or disapproved, but may not be changed as a result of NISO activity.

Standards Committee AS will prepare Dublin Core 1.1 for ballot by the NISO voting members and to respond to comments and negative votes received as a result of the ballot.

To prepare Dublin Core 1.1 for ballot, the Committee will decide whether to ballot the text of Dublin Core 1.1 alone, or accompanied by additional material. The additional material

# Alliance Metadata Standards Working Group



The Alliance Metadata Standards Working Group is an NCSA effort to develop metadata interoperability standards for use with scientific data collections on the Grid. Its work is tightly integrated with the [Grid Forum's Grid Information Service Working Group](#).

## More Information

- Some slides outlining the mission of the WG. [[.ppt](#)]
- Meeting reports and summaries
  - [Meeting of Alliance Science Portals Technical Working Group](#), Oct. 22-23, 1999.
  - [Meeting with AT Teams](#), Dec 10, 1999
  - [Meeting with Sun Portal Technologies Representatives](#), Dec 14, 1999
- Relevant Working Documents
  - The Data Grid (Ann Chervenak, Ian Foster, Carl Kesselman, Charles Salisbury, Steve Tuecke) [[.pdf](#)]
  - Chemical Engineering Scenarios:
    - Electrochemical Deposition and Dissolution Including Corrosion (Dick Alkire) [[.doc](#) [.html](#)]
    - Modeling and Control of Multidimensional Crystal Growth (Richard Braatz) [[.pdf](#)]
- Final Report

**"The Alliance Metadata Standards Working Group and the Development of Metadata-based Infrastructure for a Chemical Engineering Scenario"** [[.pdf](#) [.doc](#)]

- Useful [Links](#)



| [Semantic Web](#)

# Resource Description Framework (RDF)

Contents: [Specs](#) | [Bookmarks](#) ([Intro](#) \* [Articles](#)) | [Projects and Applications](#) | [Developer tools](#) | [Timeline](#)

Nearby: [Semantic Web Advanced Development](#) | [RDF Validator](#) | [Resource Guide](#) | [Scratchpad](#)

The Resource Description Framework (RDF) integrates a variety of applications from [library catalogs](#) and [world-wide directories](#) to [syndication](#) and [aggregation of news, software, and content](#) to [personal collections of music, photos, and events](#) using [XML](#) as an interchange syntax. The [RDF specifications](#) provide a lightweight ontology system to support the exchange of knowledge on the Web.

The [W3C Semantic Web Activity Statement](#) explains W3C's plans for RDF, including the [RDF Core WG](#) and [RDF Interest Group](#).

## RDF Specification Development

The RDF specifications consist of

- *[Resource Description Framework \(RDF\) Model and Syntax Specification](#)*

W3C Recommendation 22 February 1999

- feedback: [www-rdf-comments](#)
  - errata: [Errata in REC-rdf-syntax-19990222](#)
  - working group: [RDF Core WG](#)
  - issues: *[RDF Issue Tracking](#)* announced 5 Sep 2000
  - discussion: [www-rdf-interest](#) ([RDF Interest Group](#))
  - translations: [translations](#) French, Italian, Japanese, Spanish
- *[Resource Description Framework \(RDF\) Schema Specification 1.0](#)*



## MARC Concise Format

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## MARC LITE

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## MARC Code Lists

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# MARC STANDARDS

*Library of Congress  
Network Development and MARC Standards Office*

*The MARC formats are standards for the representation and communication of  
bibliographic and related information in machine-readable form.*

**New!** [Organization Codes Online](#)

[Understanding MARC Bibliographic](#) -- a brief description and tutorial

## [General Information](#)

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## [MARC Development](#)

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MARC Proposals  
MARC Discussion Papers  
MARC Change Form  
Canadian Committee  
on MARC  
U.S. MARC Advisory  
Committee

## [MARC SGML & XML](#)

Background information  
Beta test version  
DTDs available via FTP

## [MARC Records, Systems and Tools](#)

MARC Record Services  
MARC Systems  
MARC Specialized Tools

**Go to:** [Standards Home Page](#) | [Library of Congress Home Page](#)



**Library of Congress**

Comments: [lcweb@loc.gov](mailto:lcweb@loc.gov) (August 2, 2001/rkb)



Some of these links take you to the IMS Member Site. When you are prompted for your password, use your personal IMS username/password combination. If you have forgotten this, please contact the [webmaster](#).

## META-DATA CONFERENCE CALLS

No Calls Scheduled

## MEETINGS SCHEDULED

### Work Groups and Technical Forum Meeting - Ottawa, Canada

August 20-24, 2001

[Details](#)

## CURRENT WORK FOCUS & FORUM

[Meta-data Team](#), led by Mark Norton



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[Meta-data WG](#) | [Content WG](#) | [Question WG](#) | [Profiles WG](#) | [Competency WG](#) | [Learning Design WG](#) | [Accessibility WG](#)

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# Dublin Core/MARC/GILS Crosswalk

## Network Development and MARC Standards Office Library of Congress

**Date issued:** 2001-03-12

**Previous version:** [http://www.loc.gov/marc/dccross\\_199911.html](http://www.loc.gov/marc/dccross_199911.html)

---

### I. Introduction.

The following is a crosswalk between the fifteen elements in the [Dublin Core Element Set](#) and [MARC 21](#) bibliographic data elements. In addition, it includes a crosswalk from Dublin Core to GILS attributes. The crosswalk may be used in conversion of metadata from another syntax into MARC. For conversion of MARC 21 into Dublin Core, many fields may be mapped into a single Dublin Core element. A [MARC to Dublin Core Crosswalk](#) is also available.

In the Dublin Core to MARC mapping, two mappings are provided, one for unqualified Dublin Core elements and the other for qualified. Qualifiers used are generally based on the qualifiers approved by the Dublin Core Metadata Initiative and documented in [Dublin Core Qualifiers](#). There are some qualifiers given (for Contributor, Creator, and Publisher) that have not been approved by the Dublin Core Metadata Initiative; as these are further standardized, this crosswalk will be adjusted.

MARC 21 fields are listed with field number, then two indicator values with field name/subfield name in parentheses. If both the field and subfield have the same name, the subfield name is not included. A blank (H'20') is indicated in this document by "#". The label is a shortened form of the element name. GILS attribute names for each Dublin Core element are also given. Note that the GILS mapping has not been revised since the April 1997 version of this document.

Definitions are taken from [Dublin Core Metadata Element Set, Version 1.1: Reference Description](#). For further information about Dublin Core elements, including application notes (given in Comment), refer to that document. All Dublin Core elements are optional and repeatable. In this document elements are listed in alphabetical order by Dublin Core identifier (i.e. label).

### II. Dublin Core to MARC and GILS Crosswalk.

# Electronic Publishing:

---

- [The SGML/XML Web Page](#)
- [CS5604 unit on SGML](#): check out the related course notes offered at Virginia Tech.
- [Elsevier](#)  
[TULIP](#)

---

[\[Main\]](#) [\[Contents\]](#) [\[Topics\]](#)

---

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Members only resource: [DOM Working Group](#)

# Document Object Model (DOM)

August 22, 2001. Maintained by the W3C DOM WG.

## What's new?

[Erratum of the Document Object Model Level 2 Specifications](#): traversal-4.

NIST submitted its DOM test suite to the [DOM Conformance Test Suites](#) effort.

Juan R. Pozo made a Spanish version of the DOM Level 1 specification. Check the [translations page](#) for DOM Level 1.

The DOM Test Suites released a new [Process Document](#).

There is now a page to reference known [non-W3C DOM Bindings](#) for languages other than Java or ECMAScript. If you've done one, let us know.

The first version of the [DOM Level 3 XPath specification](#) has been published (see also [announcement](#)).

## What is the Document Object Model?

The Document Object Model is a platform- and language-neutral interface that will allow programs and scripts to dynamically access and update the content, structure and style of documents. The document can be further processed and the results of that processing can be incorporated back into the presented page. This is an overview of DOM-related materials here at W3C and around the web.

## Why the Document Object Model?

"Dynamic HTML" is a term used by some vendors to describe the combination of HTML, style sheets and scripts that allows documents to be animated. The W3C

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Document Formats Domain

# The Extensible Stylesheet Language (XSL)

XSL is a language for expressing stylesheets. It consists of three parts: [XSL Transformations](#) (XSLT): a language for transforming XML documents, the [XML Path Language](#) (XPath), an expression language used by XSLT to access or refer to parts of an XML document. (XPath is also used by the [XML Linking](#) specification). The third part is XSL Formatting Objects: an XML vocabulary for specifying formatting semantics. An XSL stylesheet specifies the presentation of a class of XML documents by describing how an instance of the class is transformed into an XML document that uses the formatting vocabulary. For a more detailed explanation of how XSL works, see the [What Is XSL](#) page.

For background information on style sheets, see the [Web style sheets](#) resource page. XSL is developed by the W3C [XSL Working Group \(members only\)](#) whose [charter](#) is to develop the next version of XSL. XSL is part of W3C's [Style Activity](#), whose work is described in the Style [Activity Statement](#).

## Specifications

- [XSLT 1.0](#) - [XPath 1.0](#) - [XSLT 1.1 \(WD\)](#) - [XSL 1.0 \(CR\)](#)

## Mailing Lists

- [XSL-List](#), main list about XSL- The XSL-FO list at W3C. [Subscription information](#), [archive](#) - [XSL-FO](#): another mailing list on FOs.

## Implementations

- XSLT: too many to list here. Check [xslt.com](#).- [XSL Formatter](#) (Win, free evaluation version)- [XEP](#) (Java, free evaluation version)- [FOP](#) (Java, open source)- [PassiveTeX](#) (TeX, open source)- [Unicorn FOs](#) (TeX, free Windows binaries)- [REXP](#) early implementation based on FOP- [jfor](#): FO to RTF converter (Java, Open Source)

## Translations

- [XPath 1.0 \(German\)](#) - [XPath1.0 \(Russian\)](#) - [XPath1.0 \(Russian\) \(2\)](#) - [XSLT1.0 \(Japanese\)](#) - [XPath 1.0](#)



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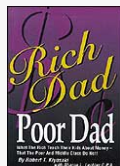
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Published By: Time Warner



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The **Internet2 Distributed Storage Infrastructure (I2-DSI)** is a replicated hosting service for Internet content and applications. The channels listed below are replicated across a distributed infrastructure consisting of servers with substantial processor and storage resources. Each user request is directed to the server closest to the requesting client in networking terms. The result is that network traffic is kept local and load is balanced among the distributed servers.

I2-DSI is a joint project of the University of Tennessee, Knoxville's [Innovative Computing Laboratory](#), the University of North Carolina at Chapel Hill's [School of Information and Library Science](#), and [Internet2](#). Contact Project Director [Micah Beck](#) (UTK) or Co-Leads [Bert J Dempsey](#) (UNC-CH) and [Terry Moore](#) (UTK).

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The [online proceedings](#) of the **1999 Network Storage Symposium (NetStore '99)** are now available.

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## I2-DSI Channels

**Servers operating in Hawaii, Indiana, North Carolina, South Dakota, Tennessee, Texas... and now Virginia Tech!**

Problems accessing these channels? Contact [I2-DSI admin](#).

<b>CPAN</b> <a href="http://cpan.dsi.internet2.edu">http://cpan.dsi.internet2.edu</a>	The Comprehensive Perl Archive Network.
<b>Docsouth</b> <a href="http://docsouth.dsi.internet2.edu">http://docsouth.dsi.internet2.edu</a>	Documenting the American South collections ( <a href="#">UNC-CH AAL</a> )
<b>High MPEG</b> <a href="http://highmpeg.dsi.internet2.edu">http://highmpeg.dsi.internet2.edu</a>	High bandwidth MPEG-1 videos for local streaming delivery.
<b>MetaLab Linux</b> <a href="http://linux.dsi.internet2.edu">http://linux.dsi.internet2.edu</a>	A comprehensive Linux repository. ( <a href="#">MetaLab</a> )
<b>Mandrake Linux</b> <a href="http://linux-mandrake.dsi.internet2.edu">http://linux-mandrake.dsi.internet2.edu</a>	A Mandrake Linux repository from Virginia Tech
<b>Mars</b> <a href="http://mars.dsi.internet2.edu">http://mars.dsi.internet2.edu</a>	The Mars'98 Polar Lander mission. ( <a href="#">NASA JPL</a> )
<b>Netlib</b> <a href="http://netlib.dsi.internet2.edu">http://netlib.dsi.internet2.edu</a>	Mathematical software, papers, and databases. ( <a href="#">UTK ICL</a> )

# Ontologies and Agents in Digital Libraries

Key topics about *Ontology* adapted from *AI Magazine*, Fall 1997, 18(3), include:

- Defn
- Comparison criteria
- Top level categories, taxonomy. categories, realtions, axioms
- Comparison chart

URLs related include:

- [Ontologies](#)
- [Indented list diagrams of important ontologies](#)
- [CYC Home Page](#) and [ontology](#) and [table of contents](#)
- [WordNet Home Page](#) and [online demo](#)
- Generalized Upper Model: [model](#), [overall organization](#), [concept hierarchy](#), [relational hierarchy](#)
- [UMLS Home Page](#) and [fact sheets](#), [MeSH](#), [Grateful Med](#) and [demo](#)
- [TOVE - Toronto Virtual Enterprise](#)
- [KIF](#) - Knowledge Interchange Format and [brief intro](#)
- [Stanford Knowledge Modeling Group](#) and [Layout Editor](#)
- [Ontolingua](#)
- [EUROKNOWLEDGE Glossary etc.](#)
- [Stanford DLI](#) and [agents](#), especially for Web browsing
  - [InterPay](#) : [Shopping Models](#), [Secure Electronic Marketplace for Europe](#)
- [ILU](#) and [Stanford testbed use](#)
- [Agents '97 Conf.](#)
- [CHI '97 Software Agents Tutorial](#) by Pattie Maes and her [Software Agents Group](#)
- [My Yahoo](#) (successor to Webdoggie from MIT)
- [IBM Agents](#), [and the Agent Building Environment \(ABE\): A toolkit for building intelligent agent applications](#)
- [Machine Learning software and datasets](#) - naive Bayes classifier - see *AI Magazine* Fall 1997 p. 18
- [IBM DL: QBIC](#), [watermarking](#) (go here and then search for "watermarking")
- Hal Berghel: [CACM Nov. 1997 40\(11\): Watermarking Cyberspace](#), and [IEEE Computer 29:7 article](#) (only if you subscribe)
- [eCash](#) (Ch. 11)

- 
- Agents: people and places
    - [iimam@site.gmu.edu](mailto:iimam@site.gmu.edu) adaptatation, intelligence

# What is an Ontology?

[Tom Gruber <gruber@ksl.stanford.edu>](mailto:gruber@ksl.stanford.edu)

Short answer:

An ontology is a specification of a conceptualization.

The word "ontology" seems to generate a lot of controversy in discussions about AI. It has a long history in philosophy, in which it refers to the subject of existence. It is also often confused with epistemology, which is about knowledge and knowing.

In the context of knowledge sharing, I use the term ontology to mean a *specification of a conceptualization*. That is, an ontology is a description (like a formal specification of a program) of the concepts and relationships that can exist for an agent or a community of agents. This definition is consistent with the usage of ontology as set-of-concept-definitions, but more general. And it is certainly a different sense of the word than its use in philosophy.

What is important is what an ontology is *for*. My colleagues and I have been designing ontologies for the purpose of enabling knowledge sharing and reuse. In that context, an ontology is a specification used for making ontological commitments. The formal definition of ontological commitment is given below. For pragmatic reasons, we choose to write an ontology as a set of definitions of formal vocabulary. Although this isn't the only way to specify a conceptualization, it has some nice properties for knowledge sharing among AI software (e.g., semantics independent of reader and context). Practically, an ontological commitment is an agreement to use a vocabulary (i.e., ask queries and make assertions) in a way that is consistent (but not complete) with respect to the theory specified by an ontology. We build agents that commit to ontologies. We design ontologies so we can share knowledge with and among these agents.

This definition is given in the article:

T. R. Gruber. A translation approach to portable ontologies. *Knowledge Acquisition*, 5(2):199-220, 1993. [Available on line](#).

A more detailed description is given in

T. R. Gruber. Toward principles for the design of ontologies used for knowledge sharing. Presented at the Padua workshop on Formal Ontology, March 1993, to appear in an edited collection by Nicola Guarino. [Available online](#).

With an excerpt attached.

# Ontologies as Indented Lists

- CYC (general ontology for commonsense knowledge, 10K concept types): Thing
  - IndividualObject
    - Event
    - Stuff (parent too of IntangibleStuff)
      - Process (child of Event too)
        - SomethingExisting
          - Intelligence
          - CompositeTangible&IntangibleObject
          - TangibleObject
            - TangibleStuff
  - Intangible
    - IntangibleObject
      - IntangibleStuff (also child of Stuff)
      - InternalMachineThing
      - AttributeValue
      - Relationship (also child of RepresentedThing)
        - Slot
          - Attribute
    - Collection (also child of RepresentedThing)
  - RepresentedThing (parent too of Collection, Relationship)
- WordNet (lexical reference system, 70K synsets): thing, entity
  - living thing, organism
    - plant, flora
    - person, human being
    - animal, fauna
  - non-living thing, object
    - natural object
    - artifact
    - food
    - substance
- Generalized Upper Model (250 concepts, for NLP): Um-thing
  - Configuration
    - Doing&Happening
    - Saying&Sensing
    - Being&Having
  - Element
    - Simple-Quality
    - Simple-Thing
    - Participant
    - Circumstance



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# Unified Medical Language System (UMLS)

NLM's Unified Medical Language System (UMLS) project develops and distributes multi-purpose, electronic "Knowledge Sources" and associated lexical programs. System developers can use the UMLS products to enhance their applications -- in systems focused on patient data, digital libraries, Web and bibliographic retrieval, natural language processing, and decision support. Researchers will find the UMLS products useful in investigating knowledge representation and retrieval questions.

- [UMLS Knowledge Source Server](#) is available to those who have signed the UMLS license agreement.
- [License Agreement for use of the UMLS Knowledge Sources](#) includes a list of vocabularies in the UMLS Metathesaurus. The UMLS products are available free of charge to U.S. and international users. Use of the UMLS Metathesaurus may require additional agreements (which may involve fees) with producers of the individual vocabularies it contains.
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contains complete description of the Knowledge Sources and their distribution formats.
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For more recent articles search Unified Medical Language System in MEDLINE.

Send questions, comments about the UMLS project to: [custserv@nlm.nih.gov](mailto:custserv@nlm.nih.gov) or call 1-888-FINDNLM.



# InterPay: A Project in the Stanford Digital Library

Public libraries have set many expectations by providing free access to high quality information. However, as budgets are slashed and prices on books and journals continue to rise, this expectation is harder and harder to support. Many libraries now charge a fee for extra services, and of course, the for-profit services and sources need to charge as well. The need for electronic currency was clear, and many rose to the challenge of providing the technical mechanisms to transfer money over the network.

However, none of the newly established vendors was able to become the dominant market player, and several competing standards co-exist, each jockeying for a position in the customer's electronic wallet. InterPay (developed in late 1994 -- early 1995) introduced three layers of abstraction which were designed to insulate the application programmer from the details of a payment mechanism. At the *application layer*, the only difference between a for-pay application and a for-free one was an additional parameter, the *payment agent* that was passed from customer to merchant. The merchant made the transition to the *payment policy layer*, asking an object known as a *Collection Agent* to collect the amount of the invoice. The collection agent dealt with the customer's payment agent, which implemented his payment policy--e.g., small amounts should be automatically approved, while larger ones required explicit user approval. The payment agent would then select one of its *payment capabilities*, such as DigiCash, First Virtual, or NetCheque. At this lowest level, called the *payment mechanism layer*, the payment capability interacted with the *collection capability* to effect the transfer and notify higher levels of the outcome.

The implementation of the InterPay architecture showed payments made by the First Virtual system co-existing with payments made through DigiCash and account-based mechanisms.

Improvements to the InterPay architecture led to UPAI, a *Universal Payment Application Interface*. In addition to a cleaner separation of the payment process from the rest of the application, UPAI specifies an asynchronous process, so multiple payments may proceed in parallel, or an initiated but not yet completed payment may be canceled.

However payment is only one part of the shopping experience, and therefore, we inaugurated a project on "**shopping models**" which broadened the scope to increase its coverage. The basic architecture seeks two objectives:

1. Interoperation of existing mechanisms for payment and delivery, and



# Stanford Digital Library

## Technologies



## SIDL-WP-1996-0052

### Shopping Models: A Flexible Architecture for Information Commerce

Steven P. Ketchpel, Hector Garcia-Molina, Andreas Paepcke

[ketchpel@cs.stanford.edu](mailto:ketchpel@cs.stanford.edu)

**Abstract:** In a digital library, there are many different interaction models between customers and information providers or merchants. Subscriptions, sessions, pay-per-view, shareware, and pre-paid vouchers are different models that each have different properties. A single merchant may use several of them. Yet if a merchant wants to support multiple models, there is a substantial amount of work to implement each one. In this paper, we formalize the shopping models which represent these different modes of consumer to merchant interaction. In addition to developing the overall architecture, we define the application program interfaces (API) to interact with the models. We show how a small number of primitives can be used to construct a wide range of shopping models that a digital library can support, and provide examples of the shopping models in operation, demonstrating their flexibility.

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This paper was created on: 11/09/96 and last revised on: 6/15/1997

**Author's Comments:** The final version that appears in the published proceedings.

**Status:** PUBLIC

[Click here to see the full text of SIDL-WP-1996-0052](#) (PS)



# Secure Electronic Marketplace for Europe

## ACTS Project AC026

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**New** The **final report** of *SEMPER* appeared in summer 2000 as Volume [1854](#) in the [Lecture Notes in Computer Science \(LNCS\)](#) Series, [Springer-Verlag](#). You can have already now a look at [Part I: The Vision of \*SEMPER\*](#) !

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*SEMPER* is a European R&D project in the area of secure electronic commerce over open networks, especially the Internet. It is executed by an interdisciplinary [consortium](#), combining experts from social sciences, finance, retail, publishing, IT and telecommunications, and has established [liaisons](#) with several related efforts.

*SEMPER* is part of the [European Commission's ACTS Programme](#) (Advanced Communications Technologies and Services), executing [Task 503](#). Funding is provided by the partner organisations, the European Union and the Swiss Federal Department for Education and Science.

For more information, see

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Research

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# Intelligent Agents Project at IBM T.J. Watson Research:

(Embeddable Intelligent Agents for Networked Applications, including Internet)

[IBM Intelligent Agents activities, overall](#)

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## NEWS: STATUS of Intelligent Agents Project at IBM T.J. Watson Research:

And lo, our project has been fruitful and multiplied!... As of 1997, the former Intelligent Agents Project at IBM T.J. Watson Research (1994-1997) has **grown and transmuted into several different agents-y projects**:

1. [Business Rules for Electronic Commerce](#): fundamental core technology and pilot applications, about intelligent rule-based agents in e-commerce. This is the closest follow-on to the former Intelligent Agents project. In particular, it is developing the CommonRules alpha prototype, a Java library of business rules capabilities, that supersedes almost all of the functionality of IBM Agent Building Environment (ABE). (ABE is in C++; its pilot prototype was RAISE.) CommonRules builds upon the techniques developed in ABE and RAISE for conflict handling and for procedural attachments (i.e., "situating").

The first alpha version of CommonRules will be released (free, with trial license) on IBM's [AlphaWorks](#) in late June or July of 1999.

2. [Information Economies](#): investigating market economies composed of multiple intelligent agents, including micro-economic interactions (and decision-making) and macro-economic emergent phenomena, especially for information goods and services.


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Technology: A.B.E.

A.B.E. is rated JARS TOP 5%

A.B.E. is an agent development kit for building intelligent agents that can interface to the Web or to USENET news services.

A.B.E. agents evaluate conditions based on developer-defined rules and then take action based on the results. For example, an agent could be programmed to check a stock price frequently and send a page when the stock price drops. Or, an agent could be used to check inventory and automatically send an e-mail order for a resupply when needed.

The development kit comes with a number of pre-built parts which make it easy for you to add agent technology to applications. The RAISE reasoning engine from IBM's T.J. Watson Research Lab is provided as the "brain" for the agent. Several adapters, or interface components, are provided to connect the reasoning engine to the outside world, including an HTTP adapter for connecting ABE agents with the Web and an NNTP adapter for connecting to the Internet news service. A time adapter is also provided to allow agents to perform time-based tasks.

In addition to the pre-built parts, programming interfaces and guidelines are provided to allow you to write your own adapters and agent applications using either C++ or Java. Source code for sample adapters and agent applications is also provided.

# Commerce, Economics, Publishers:

---

## NetBill

- [Home Page](#)
- [E-Commerce Resources](#)
- [Overview article on payment systems from IEEE Spectrum](#)
- Questions: How would this work with ETDs? What are the advantages and disadvantages relative to other approaches?

E-Commerce sites: [Yahoo](#), [Roger Clarke](#)

[The Economics of Digital Libraries by Robert M. Hayes](#)

[A Need For A Common Infrastructure: Digital Libraries and Electronic Commerce](#), Daniel Schutzer, D-Lib Magazine, April 1996

## Commerce part of CS6604 lecture

- Workshop on Tech. of Terms and Conditions; Final Report to NSF - including Breakout Group Reports
- [Cornell CS 502: Computing Methods for Digital Libraries Lecture 25 Access Management Administration](#)
- [EC98, International IFIP Working Conference on Distributed Systems for Electronic Commerce](#), Hamburg, Germany, June 4-5, 1998

[Projections for Making Money on the Web](#) (Michael Lesk, Harvard Infrastructure Conference, 23-25 January 1997)

---

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Please send comments/suggestions to [Ed Fox](#).

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# Commerce Resources

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- ◆ Overview
- ◆ News
- ◆ Publications
- ◆ Technical Partners
- ◆ Project Members
- ◆ Commerce Resources

## Electronic Commerce Resources

### Related Commerce Activities

- [CommerceNet](#)
- [Downtown Anywhere](#)
- [The Internet Shopping Network](#)
- [XIWT Report on Electronic Cash in the NII](#)
- [W3C Electronic Payments Initiatives](#)
- [Electronic Commerce Databse](#)
- ["Micropayments - No Small Change"](#), New Media article June 23, 1997
- [IESERV - Electronic Commerce](#)



### Commerce Protocols

- [Anonymous Credit Cards](#)
- [Cybercash](#)
- [Digicash](#)
- [First Virtual Holdings](#)
- [Hewlett-Packard Commerce Approach](#)
- [IBM Electronic Commerce](#)
- [Millicent](#)
- [NetCard](#)
- [NetCheque/NetCash](#)
- [NetChex](#)
- [Open Market](#)

### Web Standards and Protocols

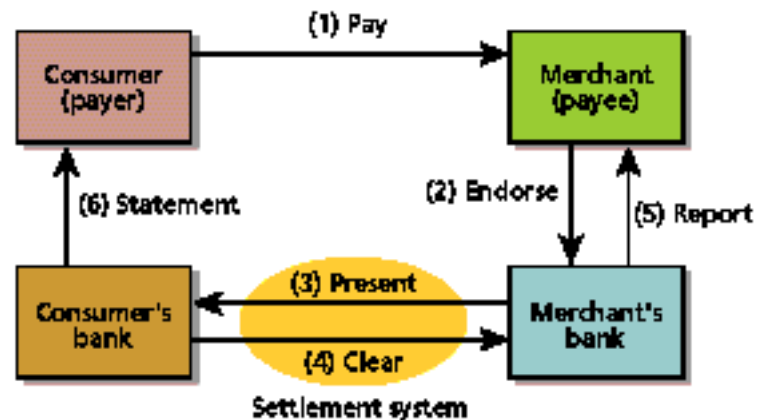
- [HTTP 2.0 specification](#)
- [WWW-Security References](#)
- [SHEN Secure HTTP proposal](#)

# CREDITS AND DEBITS ON THE INTERNET

A plethora of technologies and business models are in development to enable electronic payments

Since the advent of banking in the Middle Ages, bank customers have used paper-based instruments to move money between accounts. In the past 25 years, electronic messages moving through private networks have replaced paper for most of the value exchanged among banks each day. With the arrival of the Internet as a mass market data network, new technologies and business models are being developed to facilitate electronic credit and debit transfers by ordinary consumers.

These new systems include CyberCash (which is a gateway between the Internet and the authorization networks of the major credit cards) and the Secure Electronic Transactions protocol (a standard for presenting credit card transactions on the Internet), as well as First Virtual (a way of using e-mail to secure approval for credit card purchases of information), GC Tech (a payment system that can use credit or debit via an intermediation server), and NetBill (a public-private-key encryption system for purchasing information).



## Conventional checking

In today's banking world, money consists of ledger entries on the books of banks or other financial institutions. A checking account, also known as a demand deposit account (DDA), records deposits by the consumer and can be used, via the consumer's instructions in the form of a check, to make payments to third parties. Typically, a check is written by a consumer, authenticated by signature, and presented to a merchant, who may endorse it with a signature before presenting it to a bank for payment. If the merchant's bank and the consumer's bank are the same, it can simply transfer the funds on its ledgers from the consumer's account to the merchant's. If the payer and the payee keep accounts at different banks, the payee bank presents the check for settlement to the payer's bank and receives the funds in return through a settlement system. Several private check clearinghouse systems, as well as the Federal Reserve system, provide settlement services in the United States [Fig. 1].



[Home](#) > [Business and Economy](#) >

## Electronic Commerce

all of Yahoo!    just this category

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- [Consumer Information](#) (30)
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- [Digital Money](#) (9)
- [Electronic Data Interchange \(EDI\)](#) (7)
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- [Software@](#)
- [Use Tax Issues@](#)

### More Yahoo!

[News: Electronic Commerce](#)

[News: Internet Privacy](#)

[News: Online Auctions](#)

[News: Online Investing](#)

[Y! Store](#)

build your own

### Site Listings

### Most Popular

# Roger Clarke's Electronic Commerce Pages

[Roger Clarke](#)

Principal, [Xamax Consultancy Pty Ltd](#), Canberra

Visiting Fellow, [Department of Computer Science](#), [Australian National University](#)

© [Xamax Consultancy Pty Ltd](#), 1995-2001

This document is at <http://www.anu.edu.au/people/Roger.Clarke/EC/index.html>

---

This site comprises a couple of hundred of my own papers, plus categorised links to many other sites. It's been providing access to e-commerce resources since the beginning of 1995, and has registered a couple of million hits. It provides access to:

- [my introductory papers](#);
- [my papers on more advanced topics](#);
- [a search service within this site](#);
- [the consultancy pages](#) of myself and a strategic partner; and
- [categorised links to many other pages](#) (last checked in September 2000). Be warned: I'm too busy consulting to spend as much time maintaining the set of external links as I'd like. But, on the other hand, it's linked to by a great many people, and the site attracts well over 1 million visits per year - so it's presumably of some value to quite a lot of people.

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## The Scope of EC

'Electronic commerce' (EC or e-commerce) is an integrative concept, designed to draw together a wide range of business support services, including inter-organisational e-mail; directories; trading support systems for commodities, products, customised products and custom-built goods and services; ordering and logistic support systems; settlement support systems; and management information and statistical reporting systems.

Some people use the more restrictive terms 'electronic trading' and 'electronic markets', and others use broader terms such as 'electronic business'. Some people also restrict the scope of EC to procurement; but it's more usefully conceived much more broadly, to include any kind of business-related transaction conducted with the assistance of electronic tools. Yep, even the telephone and fax.

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## Introductory Papers

Here's a set of **foundation papers**:

# THE ECONOMICS OF DIGITAL LIBRARIES

[SIBi](#)

Robert M. Hayes  
University of California, Los Angeles ([rhayes@ucla.edu](mailto:rhayes@ucla.edu))

[USP](#)

## Context & Overview

### *Context*

Before presenting the substance of this paper, I want to set the context and motivation for it. My examination of the "economics" of digital libraries arose from a concern about the extent to which some persons viewed them as replacing print forms of distribution and as replacing libraries as we know them by electronic delivery, especially on-line through the Internet. Those views have been expressed not only by the enthusiasts for electronic distribution as replacement for print but by academic administrators who hope that they will not need to continue erecting new library buildings and acquiring additional collections of dusty old books.

In my view, the two forms of distribution (print and electronic) are not substitutable for each other (what the economists call "fungible") but are complementary, serving substantially different functions and purposes. Indeed, instead of one substituting for the other, use of one increases the need for and use of the other.

Leaving that aside, though, it is also my view that the enthusiasts and the administrators have failed to recognize the economic facts in the costs involved in creation, distribution, and use of both media or in the decisions by publishers about how they will distribute and when they will change the means for distribution. Those facts are by no means easy to obtain or to rationalize, especially as they relate to the Internet which is growing at such a rate that data obtained at any given time cannot effectively be related to data obtained at other times. It is for this reason that what I present in this talk is exploratory, speculative, and largely descriptive.

### *Overview*

My talk today will cover the following topics:

#### **Definition, Sources, Economic Roles & Properties**

#### **The Micro-Economics of Digital Libraries**

##### **Capital Costs of Digital Libraries**

##### **Operating Costs in Distribution of Digital Libraries**

##### **Income from Digital Libraries to Producers**

##### **Value of Digital Libraries to Users**

#### **The Macro-Economics of Digital Libraries**

## Conclusion

### **Definition, Sources, and Economic Properties**

#### ***Definition of "Digital Library"***

# A Need For A Common Infrastructure

## Digital Libraries and Electronic Commerce

Daniel Schutzer

Vice President and Director of Advanced Technology, Citibank and  
President of the Financial Services Technology Consortium

Citibank

New York, N.Y.

*dan.schutzer@citicorp.com*

**D-Lib Magazine**, April 1996

ISSN 1082-9873

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## Electronic Commerce and Digital Libraries Have Much in Common

Electronic commerce is the ability to perform transactions involving the exchange, or use, of goods or services between two or more parties using electronic tools and techniques. The goods exchanged could be electronic documents and digital objects (e.g. text, data, images, videos, software programs, and composites of all of the above) - the stuff one finds in Digital Libraries. In fact, information products, like electronic documents and digital objects are particularly important because they represent the purest form of Electronic Commerce. Indeed Electronic Commerce, with its greatly reduced cost of production and distribution makes many new knowledge businesses practical that were previously impractical.

For example, a fully realized infrastructure for Electronic Commerce would make it practical for authors to charge pennies for paragraphs and still make a profit - because the author can reach millions world-wide over the Internet, who can pay and download the paragraph at little or no cost to the author.

Selling documents, or charging for their use, over the Internet offers many advantages over traditional paper-based libraries:

- It provides the customer with more choices and customization options (e.g. choice of font).
- It decreases the time and cost of search and discovery, both in terms of customers finding electronic documents and object and authors finding customers (e.g., advertising, target

# Trends in Electronic Commerce **TR EC** 98

Hamburg, Germany: June 3.-5.1998

*the  
conference*

Welcome to the home page of the GI/IFIP Conference 'Trends in Electronic Commerce 98' in Hamburg. This WWW-site gives an overview of the conference topics, sessions and presentations of the TrEC'98 conference. TrEC'98 follows a tradition of GI/IFIP workshops and conferences on 'Trends in Distributed Systems' held in Germany during recent years.

*invited  
speakers*

*schedule/  
slides*

*setting &  
directions*

*tutorials*

*online-  
registration*

*conference-  
dinner*

The conference has successfully taken place with over 260 participants from 26 countries. On these pages you can find an overview of the conference topics, the conference schedule, the conference dinner, and tutorials that were organized. Also we provide most of the slides of the given presentations. You can download them by following the links in the schedule. You can also access the [picturebook of photos](#) we took at the conference.

*contact &  
committees*

If you need any additional information or if you have comments or suggestions - feel free to [eMail](#) us...

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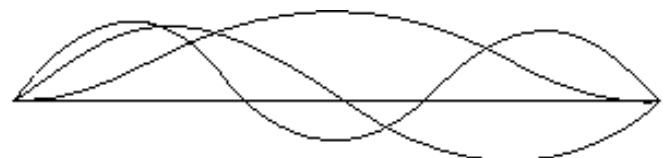
IFIP



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PONTON HAMBURG

# Projections for Making Money on the Web

## Michael Lesk

Harvard Infrastructure Conference, 23-25 January 1997

### Abstract

Numerous groups will sell you advice on getting rich on the Web; they discuss online sales of information, retail catalog shopping, advertising, consulting, and connectivity. What will actually pay for the Web? What is the `killer ap'?

This paper contains a great many conflicting numbers. The different predictors of future revenues differ; even the measures of current success differ. No effort is made to resolve the conflicts, since knowing the spread in estimates may be of value to the reader.

My personal projection for getting rich: connectivity.

### 1. Introduction.

What is going to pay for the Web? Why should Web site providers continue to do the work of writing, drawing, and coding, plus bear the cost of equipment and communication lines? Justification for Web sites includes many reasons which involve no direct financial gain, such as self-promotion. However, many site builders are hoping to get rich, despite costs that may run over \$1M for a large professionally designed set of corporate web pages.

Among the possible models of finding wealth on the Internet are:

1. Selling objects via the Web. In this dream, the L. L. Bean catalog is replaced by a set of web pages, and calling the 800 number changes into web clicks. Delivery would still be via a parcel carrier.
2. Selling information via the Web. Again, people look at web pages and buy things, but the result can be sent to them directly since it is electronic access. People may pay item by item, or for continuous or regular access to a particular information service.
3. Selling advice. In this case, the basic information is free; and what is being sold is some kind of selection, editing, or consulting related to it.
4. Selling advertising. Again, the information is free, and is supported by advertising in the same way as broadcast TV. For the last year this has been perhaps the most hyped possibility for paying



# Micropayments Overview

[Micropayments](#) - [Overview](#) - [Recommended Reading](#)

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## The W3C Ecommerce/Micropayment Activity is now closed.

An major factor in the evolution of the Web is Electronic Commerce: the ability to buy, sell, and advertise goods and services to customers and consumers. One concern in the development of Electronic Commerce on the Web is the trust that can be placed in the provenance, reliability, security and privacy of information available from or transferred over the internet. Another concern is the need for low friction commerce transactions allowing quality and ease of use for consumers, a key factor the future of Electronic Commerce. The potential for global electronic commerce is immense; much of this potential is and will be realized by the continued development of Web technologies. The World Wide Web Consortium, leading the web to its full potential, is therefore concerned with the evolution of Electronic Commerce on the Web. The role of W3C is to focus on core infrastructure technologies for Electronic Commerce and identify common infrastructure needed in this area. W3C is not committed for example in specifying banking systems nor schemas for specific Electronic Commerce applications.

W3C has closed its Ecommerce and Micropayment Activity, but through the following activities W3C is committed to key factors for success in the evolution of Electronic Commerce:

- The W3C [XML Signature](#) provides a mechanism for signing documents and metadata in order to establish who made the statement.
- The W3C [XML Encryption](#) specifies a process for encrypting/decrypting digital content and an XML syntax used to represent the encrypted content and information that enables an intended recipient to decrypt it.
- The W3C [XML Protocol](#) goal is to develop technologies which allow two



# DIGITAL LIBRARY FEDERATION

[Printer-Friendly Page](#)

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[Use & Users](#)

[Roles & Responsibilities](#)

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[Publications & Resources](#)

## Digital Preservation

Building on the work of the Commission on Preservation and Access (CPA), CLIR and the DLF remain committed to maintaining long-term access to the digital intellectual and scholarly record. They have a particular interest in practical initiatives and in research into most poorly understood areas. This page links to CLIR, DLF, and CPA preservation [initiatives](#), [research reports](#), and [related information resources](#).

### Preservation initiatives

#### Preservation of electronic scholarly journals

A practical initiative to identify and build consensus around appropriate archival practices and to facilitate the development of lasting digital archival repositories for electronic scholarly journals. The pages include a [web site](#) for a program funded by the Andrew W. Mellon Foundation to plan long-term archival solutions for electronic scholarly journals.

### Research reports

#### Risk Management of Digital Information: A File Format Investigation (June 2000)

This report by Gregory W. Lawrence, William R. Kehoe, Oya Y. Rieger, William H. Walters, and Anne R. Kenney is based on an investigation conducted by Cornell University Library to assess the risks to digital file formats during migration. The report includes a workbook that will help library staff identify potential risks associated with migrating digital information. Each section of the workbook opens with a brief issue summary; this is followed by questions that will guide users in completing a risk assessment. The appendixes also include two case studies for migration: one for image files and the other for numeric files.



**PADI is a subject gateway to digital preservation resources**

## **Resource Types**

**News and discussion:**

**padiforum-l**

**Events**

**Policies, Strategies and Guidelines**

**Projects**

**Organisations and Websites**

**Bibliographies**

**Discussion Lists**

**Glossaries**

**Journals and Newsletters**

## **Digital Preservation Topics**

▶ **General Resources**

▶ **Issues**

▶ **Strategies**

▶ **Rights Management**

▶ **Data Documentation and Standards**

▶ **Formats and Media**

▶ **National Approaches**

▶ **Digitisation**

▶ **Digital Records**

▶ **Digital Libraries**

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**PADIUpdate**



**NATIONAL LIBRARY OF AUSTRALIA**, Canberra, ACT 2600, AUSTRALIA

Telephone + 61 2 6262 1111; Facsimile +61 2 6257 1703; Telephone Typewriter Number: 1800 026 372

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The PADI site contains links to a wide range of resources which do not belong to the National Library of Australia. While the National Library of Australia aims to provide links which will be useful to those interested in preserving access to digital information, it cannot endorse these sites or guarantee the content of linked resources.

---

# Digital Preservation of Moving Image Material?

Accepted for publication in: **The Moving Image**, Fall 2001  
written March 2001

Howard Besser  
UCLA School of Education & Information Studies  
<http://www.gseis.ucla.edu/~howard/>  
<http://sunsite.berkeley.edu/Longevity/>

Digital imaging and broadband networks are changing the moving image production and distribution process. In response to these changes, preservationists need to not only re-think some of their daily practices, but also need to engage in some fundamental paradigm shifts in how they view the preservation process. This article first describes some of the technological-induced changes in moving image production and distribution. It then discusses how those changes are altering viewer habits and expectations, and how those in turn affect how we will need to deliver and store moving image materials. Then the article explains the various approaches to preserving digital materials. Finally, the author points to two paradigm shifts that will be likely for moving image preservation: from preserving completed works as a whole to asset management, and from preserving an artifact to preserving disembodied content.

## Introduction

The advent of digital technology is leading to widespread changes in moving image production. These changes are reverberating through all aspects of moving images -- from distribution channels to user expectations. Though the timelines and extent of many of these changes are overly inflated, these changes are still likely to force a dramatic shift in the film preservation paradigm. Key shifts will cluster around 2 areas: the first -- a movement from saving finished works as a whole to an asset-management approach that deals both with component parts of works and with ancillary materials that relate to the work. The second -- learning how to shift from a mode focused on preserving an original negative or print as a physical artifact to one instead focused on saving a digital work that has no tangible embodiment.

Electronic works are encoded and usually stored on a physical storage devices such as a digital or analog

# Intellectual property rights, copyright laws and legal issues:

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(Chapter 10, page 223, "Books, Bucks and Bytes", Michael Lesk)

- [Cyberspace Law for Non-Lawyers](#): This is an electronic course : a "real" course in the "real world" This site includes a discussion function which will allow you, if you are so inclined, to post your own comments and reactions to the individual messages that the instructors have mailed out.
- [Pamela Samuelson](#) and pointers based on her pages and recommendations
- [Electronic Commerce](#)
- [EC98, International IFIP Working Conference on Distributed Systems for Electronic Commerce](#), Hamburg, Germany, June 4-5, 1998
- [Stanford U. work on electronic commerce, legal pointers](#)
- Copyright law in Netherlands (in Dutch): [background home page](#), [page on intellectual property and copyright](#)

## Other related references:

- Digital Copyright Protection - Peter Wayner - AP Professional - Boston, 1997
- Scholarly Publishing: The Electronic Frontier - ed. Robin P. Peek and Gregory B. Newby - The MIT Press, Cambridge, MA, 1996
- The Network Nation - Starr Roxanne Hiltz and Murray Turoff - The MIT Press, Cambridge, MA, 1994
- Ubiquitous Email ...

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Please send comments/suggestions to [Ed Fox](#).

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# Cyberspace Law for Non-Lawyers

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## Lesson 1:

# Introduction

Welcome to the Cyberspace Law for Non-Lawyers electronic course. As with a "real" course in the "real world," let's begin with a few logistical details.

You can expect one email message every Monday, Wednesday, and Friday for the duration of the course. Each message should be no more than two - four individual screens or so. We anticipate that the course will last for approximately three months.

Please note that this course is running on a one-way listserver; do not reply to any of the messages you receive, for your replies will not be transmitted anywhere (and will simply clog up the listserver). We have, however, made arrangements with Counsel Connect and Court TV to post all of our course material on a World Wide Web site; the URL is

<http://www.counsel.com/cyberspace>

This site includes a discussion function which will allow you, if you are so inclined, to post your own comments and reactions to the individual messages that we have mailed out.

Because this course is going to cover "cyberspace law for non-lawyers," we should probably begin with a few words about what we mean by "cyberspace law." Cyberspace is a new and exciting frontier, and presents a host of new and difficult legal questions in many areas. The development of legal rules that will govern activity in this new environment is likely to be a complex, and at times a controversial, process. We hope to give you a basic framework that will help you think about some of the questions that have arisen in six areas of the law: copyright, privacy, trademark, libel, free expression, and contracting.

# Pamela Samuelson Plus Recommendations on Law and Digital Libraries

[Professor Pamela Samuelson](#) is one of the leading authorities on legal issues in the area of intellectual property rights (IPR). A new [MacArthur Fellow](#), a Fellow of the [Electronic Frontier Foundation](#), a Fellow of the [Cyberspace Law Institute](#), she is a Professor at the [University of California at Berkeley](#) with a joint appointment in the [School of Information Management and Systems](#) and the [School of Law](#).

For more information on this and related topics, see

- [Selected Papers by Pamela Samuelson](#)
- [Law 276: Cyberlaw](#) - by Pamela Samuelson, University CA, Berkeley
- [Infosys 296A: Future of the Information Society, Copyright & Community](#) - by Peter Lyman and Pamela Samuelson, University CA, Berkeley
- [Cyberspace Law for Non-Lawyers](#), which attracted over 20,000 subscribers, by [David Post](#), Temple U. School of Law; Lawrence Lessig, [Harvard Law School](#); [Eugene Volokh](#), [UCLA School of Law](#)
- [Crash Course in Copyright](#) from UT system, including the [Digital Library](#)
- [Copyright Management Center](#) of IUPUI, directed by [Kenneth Crews](#)
- [The ILTguide to Copyright](#) at Columbia, for educators
- [Copyright Law Materials](#) at Cornell Legal Info. Institute
- [Copyright & Fair Use](#) site of Stanford University Libraries
- [Copyright Basics Circular from the U.S. Copyright Office](#)
- [Copyright Clearance Center \(CCC\) Online](#)
- [Digital Future Coalition \(DFC\)](#)
- [IIP Policy Gateway, Harvard Information Infrastructure Project](#)
  - [Bibliography](#)
  - [Policy resources in the area of Internet governance](#), supplement to MIT Press [book](#)
  - The Impact of the Internet on Communications Policy [conference](#)
- [ALAWON](#) - ALA (American Library Association) Washington Office Newslines providing urgent and late breaking news
- [ARL Federal Relations and Information Policy Program](#), Prue Adler

# Intellectuele eigendom



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Het [Benelux Merkenbureau](#).

Het [Europees Merkenbureau](#).

Het [Nederlands Octrooibureau](#).

[Commissariaat voor de Media](#). O.a. besluiten van het Commissariaat, mediaregelgeving en -beleid, etc.

[Europese voorstellen](#) met betrekking tot intellectueel eigendomsrecht.

[DG Internal Market; Intellectual Property](#).

[Trademark Electronic Search System \(TESS\)](#) van het US Patent and Trademark Office.

[Access ~ Intellectual Property Law](#) geeft links naar intellectuele eigendom, computerrecht, auteursrecht, Internet-recht, multimediarrecht, octrooirecht, merkenrecht en naar regelgeving, media en pagina's op deze gebieden.

[WWW Virtual Law Library; Intellectual Property Links](#).

De [Intellectuele eigendom links van de Universiteitsbibliotheek Utrecht](#).

[Samenvatting van het Advies Auteursrecht en de Nieuwe Media](#) van de Commissie Auteursrecht van het Ministerie van Justitie.

In de V.S. heeft [een districtsrechter uitgesproken](#) dat ook op *verrijkte* overheidsinformatie geen auteursrecht rust, zodat het toegestaan is teksten uit jurisprudentiebundels van de ene uitgever te scannen voor opname op een CD-ROM van een andere uitgever.

[How may I do trademark research on the Internet?](#).

Het UK Patent Office heeft het [UK Trade Marks Register](#) online gezet.

Bij merkenbureau Markgraaf kunt u onder '[zoek op merk](#)' nagaan of een merk al gedeponeerd is.

# Digital Preservation Archiving and Copyright

## Problem Description and Legislative Proposal (Version 2)

[H.M. Gladney](#)

20044 Glen Brae Drive  
San Jose, California 95120  
[gladney@almaden.ibm.com](mailto:gladney@almaden.ibm.com)

13<sup>th</sup> August 2000

**Abstract:** We are witnessing a dramatic shift from physical media to digital sources that are sometimes the only published forms of monographs, periodicals, music, news, and other records of permanent value. This shift is not accompanied by sufficient action to preserve works beyond their owners' transitory interest.

Several challenges hinder effective American contributions to world-wide digital archiving. Among these are archives' liability risks as co-defendants in copyright infringement lawsuits. These can be solved only with a modest copyright law change to hold bona fide archives blameless in pertinent digital copying and distribution activities.

In contrast to what they do with print versions of scholarly periodicals, digital publishers do not provide complete periodical runs to research libraries, but instead sell limited term, limited community access licenses. A consequent risk is that a publisher might never leave a publicly accessible copy—not even after copyright expires. We believe this will be unacceptable to the public once it understands that such a risk exists. We intend to convey it, and to ask for the obvious mitigation at the same time we ask for “safe harbor” copyright legislation.

© 2000 H.M. Gladney. This is a draft made available for critical feedback. Republication is prohibited unless authorized in writing by the author. Non-commercial copying and distribution are permitted provided that this is done for the entire article without alteration

# Social Issues:

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- Social Aspects [D-Lib Working Group](#)
- UCLA Workshop, Social Aspects of Digital Libraries, Feb. 16-17, 1996  
<http://is.gseis.ucla.edu/research/dl/index.html>
  - Life Cycle [http://www-lis.gseis.ucla.edu/DL/UCLA\\_DL\\_model.gif](http://www-lis.gseis.ucla.edu/DL/UCLA_DL_model.gif)
- [The social functions of digital libraries: designing information resources for virtual communities](#) - by Peter Lyman

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Please send comments/suggestions to [Ed Fox](#).

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# D-Lib Group on Social Aspects of Digital Libraries

## I. UCLA-NSF Workshop on Social Aspects of Digital Libraries

An invitational workshop was held at UCLA, February 15-17, 1996; 32 researchers, developers, and practitioners, 9 UCLA faculty facilitators, and 6 UCLA graduate research assistants participated. All materials from the workshop, including schedule and agenda, list of participants, participants' discussion papers and biographical statements, and summary reports presented at the meeting are available on the web site (<http://www.gslis.ucla.edu/DL/>).

We selected two research areas, each with three sub-topics, as focal points for a two-day workshop:

Information Needs: Identifying real information needs and developing digital libraries to meet those needs.

- Social context and culture
- Information needs and information seeking
- Linking user-learner needs and behavior to digital library design

End user searching and filtering: Designing digital libraries in which it is possible to find the right information in a glut of information.

- Organization, description and representation of information
- Search capabilities for users
- Interface design for information retrieval

## II. Results of the workshop

While we bounded the scope of the workshop to provide a starting point for discussion and a set of criteria for selecting participants, our participants quickly expanded those boundaries.

The boundaries expanded in several directions:

- Level of analysis: Our scope, as stated in the background paper (see web site), focused on the needs and activities of the individual user. While important, we must recognize that individuals do not work with information resources in isolation from their communities. They perform individual tasks in the context of their work teams, classroom, and other social organizations. Many tasks are performed in group contexts; we must consider CSCW and collaborative environments as well. Multiple levels of analysis are required.

# Social Aspects of Digital Libraries

A workshop hosted by:

[The Department of Information Studies](#)  
[Graduate School of Education & Information Studies \(GSE&IS\)](#)  
[University of California, Los Angeles](#)

February 16-17, 1996

Sponsored By:

[Information Technology and Organizations Program](#)  
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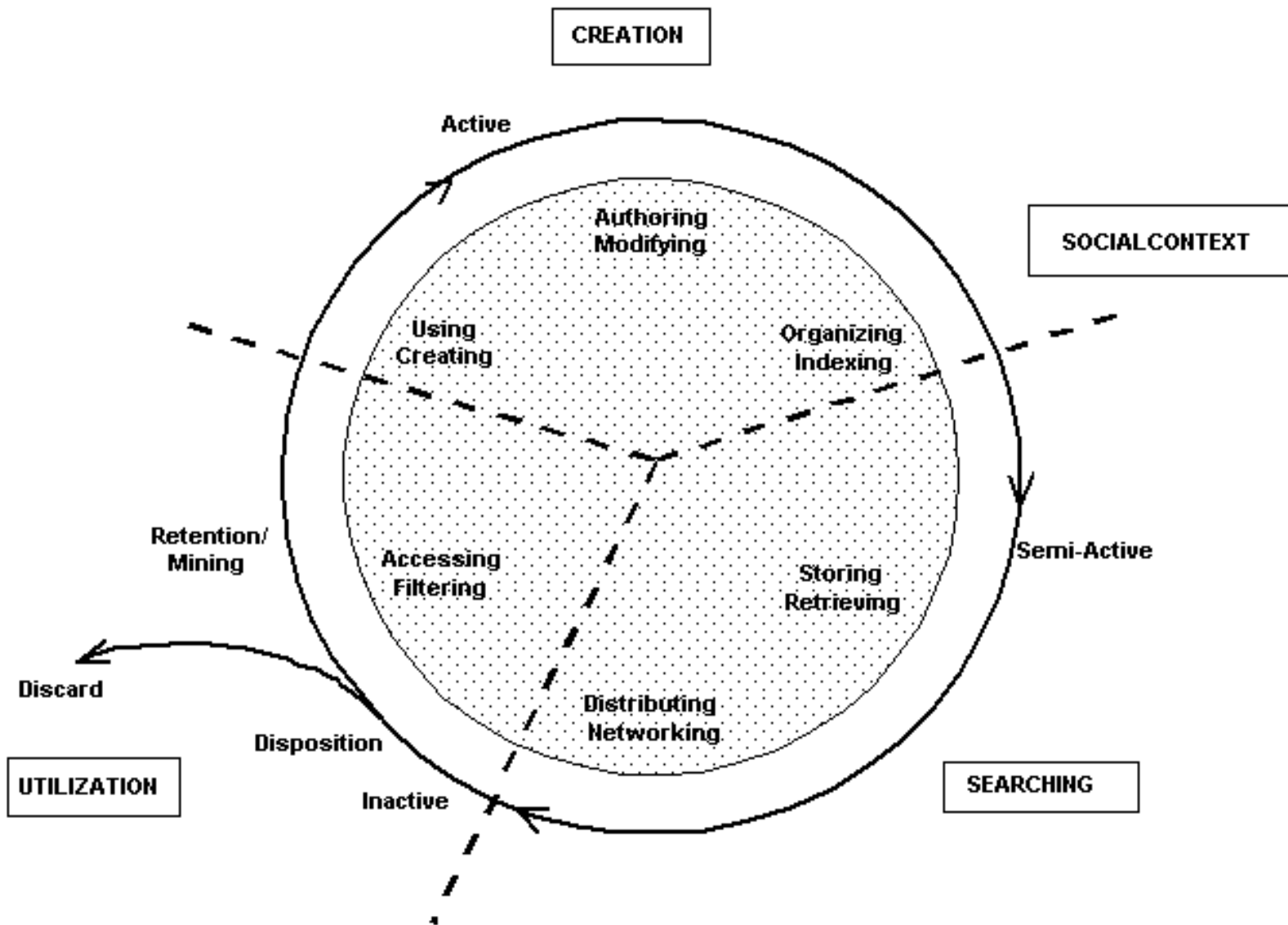
## Contents

- **Workshop Final Report**
  - [HTML format](#)
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- [Introduction from Stephen M. Griffin, NSF DLI Interagency Coordinating Committee Chair](#)
- [Preliminary Workshop Report Presented at ACM Digital Libraries '96 Conference](#)
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- [Participant Papers](#)
- [Participant Biographies](#)
- [Organizers and Managers of the Workshop](#)
- [The Workshop Site](#)
- [Other Digital Libraries Sites](#)

## Description

This workshop brought together 32 scholars, researchers, and practitioners from the emerging community concerned with social aspects of digital libraries, plus the 8 UCLA investigators (Marcia J. Bates, Christine L. Borgman, Michele V. Cloonan, Efthimis N. Efthimiadis, Anne J. Gilliland-Swetland, Yasmin B. Kafai, Gregory H. Leazer, and Anthony B. Maddox). Our goals were to assess existing knowledge that might inform research in this area and to propose a research agenda that would pose new questions.

## Information Life Cycle



NOTE: The outer ring indicates the life cycle stages (active, semi-active, and inactive) for a given type of information artifact (such as business records, artworks, documents, or scientific data). The stages are superimposed on six types of information uses or processes (shaded circle). The cycle has three major phases: information creation, searching, and utilization. The alignment of the cycle stages with the steps of information handling and process phases may vary according to the particular social or institutional context.

# Digital libraries forum

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## The social functions of digital libraries: designing information resources for virtual communities

**Peter Lyman**

Professor, School of Information Management and Systems,  
University of California Berkeley

*Print libraries are more than books and buildings; they provide context for a number of important kinds of social relationships: they are places, one of the truly successful public institutions; they provide information services, which are catalysts for invention, research and education; and they regulate the boundary between commerce and communities, market exchange and gift exchange. This paper explores the the nature of digital libraries as social institutions, and suggests an agenda for action for librarians and information science.*

- *Community: Can cyberspace evoke a sense of place, capable of supporting a sense of intellectual community?*
- *Information society: What do we know about digital information, its use and the kinds of social relationships and institutions that are now being invented around it?*
- *Intellectual property: In the United States today, politicians are engineering an enclosure of the information commons, creating a 'pay per view' digital library. Yet at the same time, digital libraries far transcend national boundaries and regulatory power, and the Web's seven million authors have created an entirely new information commons. What will be the relationship between these two digital libraries?*

What should a digital library be and do? For all of the promise of information technology, the future of libraries will be determined more by intellectual property policy than by technology. It is not information



# Platform for Internet Content

## Selection (PICS)

The **PICS<sup>TM</sup>** specification enables labels (metadata) to be associated with Internet content. It was originally designed to help parents and teachers control what children access on the Internet, but it also facilitates other uses for labels, including code signing and privacy. The PICS platform is one on which other rating services and filtering software have been built. Parents who are interested in finding filtering software or ISPs that offer filtering will probably want to consult [www.netparents.org](http://www.netparents.org) rather than this site.

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- [What Governments, Media, and Individuals are Saying about PICS \(pro and con\)](#)
- [Technical Specifications](#)
- [Resources for developers of software and labeling services](#)
- [Lists of PICS-compatible products and services](#)
- [Hints on self-labeling](#)
- [Innovative uses of PICS labels](#)
- [RDF](#)

## See also

- [PICS Frequently Asked Questions](#)



## Digital Divide Links

- [The Digital Divide Network](#)
- [DigitalDivide.gov](#)
- [Helping.org](#)

# Digital Divide

As computer networking becomes increasingly important to economic and social success, many people in inner cities and isolated rural areas are failing to acquire the new technology as rapidly as their more affluent neighbors. Strong government policies and private initiatives are needed to ensure that the new information tools do not widen social divisions based on socioeconomic status and geography. At stake is whether individuals are able to fully participate in today's job market; whether underserved communities obtain the proper tools for making use of networking technologies; and ensuring that society benefits from the contributions that diverse communities can make to our economy and culture.

In recent months, attention to the Digital Divide has increased. In December of 1999 the Federal government hosted the first national Digital Divide Summit to discuss what roles government agencies, industry, foundations and nonprofits could play in working toward collaborative solutions to this important problem.

**Learn more about the stakes of the Digital Divide and follow the work of government, industry, foundations through the [Digital Divide Network](#) ([www.digitaldividenetwork.org](http://www.digitaldividenetwork.org)).**

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### **Search of the Week**

Criteria: Chinese  
(Creator Nationality)  
and 1245-1382  
(Creation Date)

- [Past "Searches of the Week"](#)
- [Search the Thumbnail Catalog](#)

### **What's New ....**

- [\*\*H.W. Wilson and AMICO Agree to Distribution of The AMICO Library via WilsonWeb\*\*](#)
- [\*\*Distribution Agreement Renewed with Research Libraries Group\*\*](#)
- [\*\*New Collaboration Announced with Scottish Cultural Resources Access Network \(SCRAN\)\*\*](#)
- [\*\*Ideas for Use: the AMICO Model Assignments\*\*](#)



## **About AMICO**

The Art Museum Image Consortium (AMICO) is a not-for-profit organization of institutions with collections of art, collaborating to enable educational use of museum multimedia.

Together, AMICO Members are building [\*\*The AMICO Library\*\*](#), a licensed digital educational resource available under subscription to universities and colleges, public libraries, elementary and secondary schools, and museums.

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