Cornell University
Computing and Information Science

CS 5150 Software Engineering

Usability and User Interfaces

William Y. Arms

Human Computer Interaction

Human Computer Interaction is the academic discipline that studies how people interact with computers.

The Information Science and Communication departments offer a series of courses in Human Computer Interaction and have major research programs in this area.

The Importance of User Interface Design

A computer system is only as good as the interface it provides to its users

- Appropriate functionality, easy navigation, elegant design, and fast response times make a measurable difference to a system's effectiveness
- If a system is hard to use:
  - ⇒ users may fail to find important results, or mis-interpret what they do find
  - ⇒ users may give up in disgust

Good support for users is more than a cosmetic flourish

- **Usability** is more than **user interface design**.
- Developing good user interfaces needs **skill** and **time**.

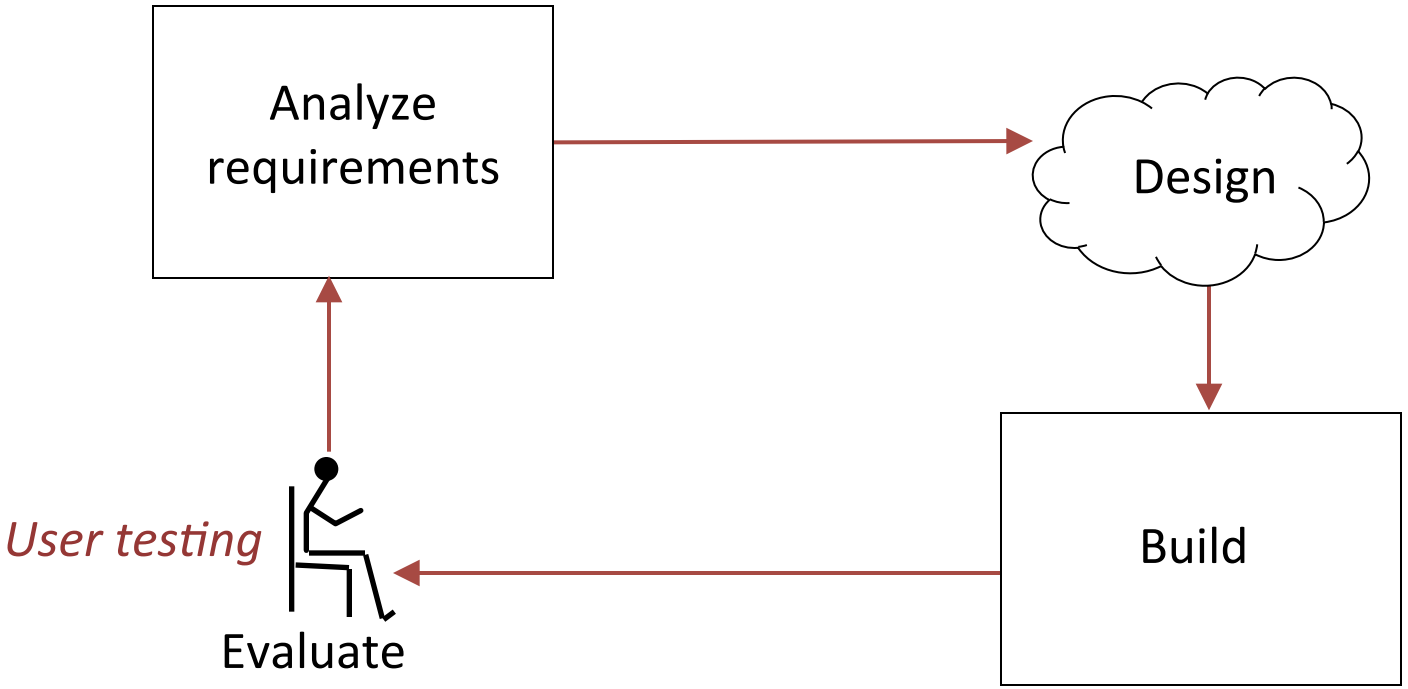
Development Processes for User Interfaces

It is almost impossible to specify an interactive or graphical interface in a textual document.

- **Requirements** benefit from sketches, comparison with existing systems, etc.
- **Designs** should include graphical elements and benefit from a mock-up or other form of prototype.
- User interfaces must be **tested with users**. Expect to change the requirements and design as the result of testing.
- **Schedules** should include user testing and **time to make changes**.

Whatever process you use to develop a software system, the development of the user interface is always iterative.

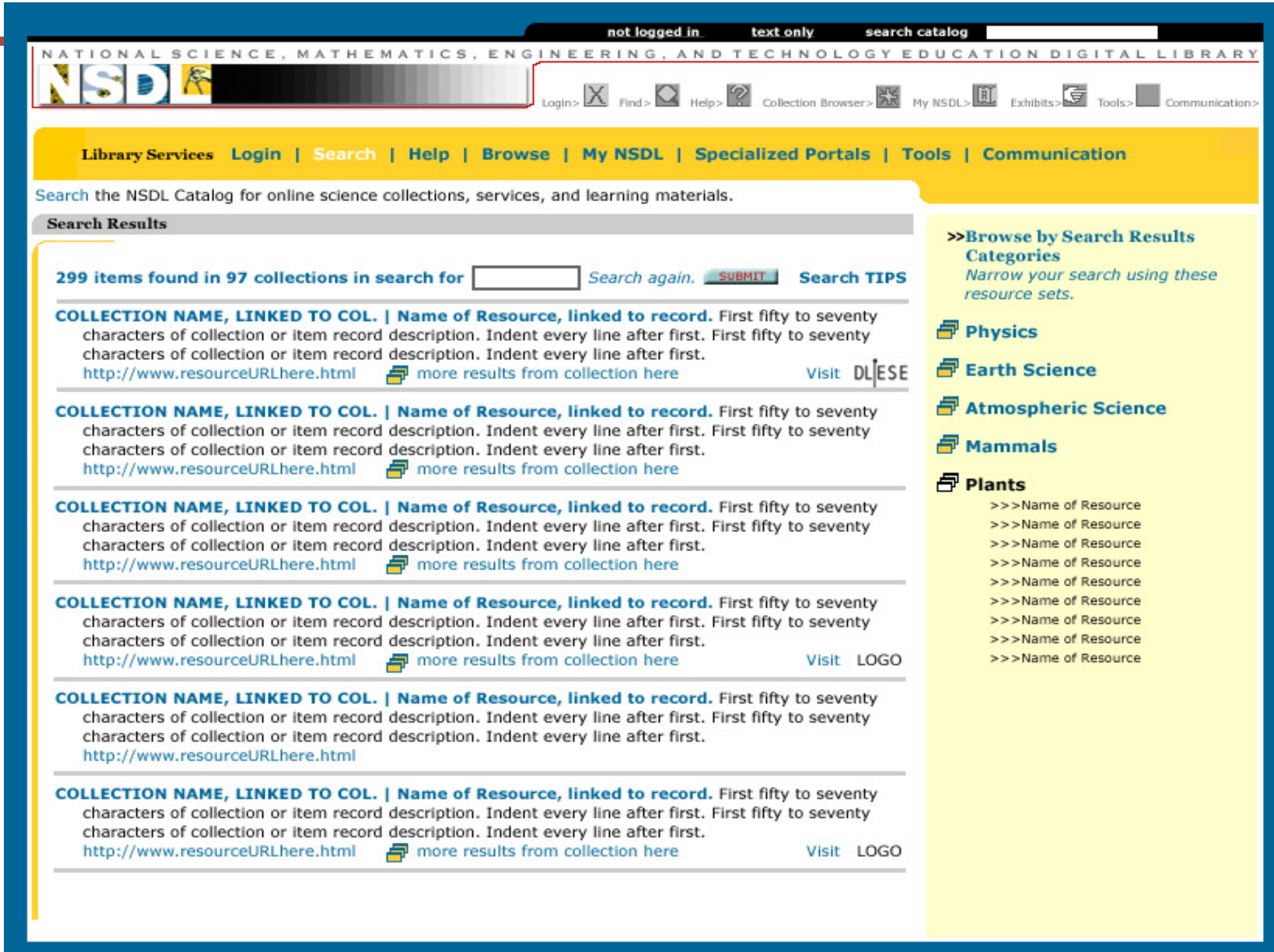
Usability:
The Analyze/Design/Build/Evaluate Loop



Tools for Usability Requirements and Evaluation

	Initial	Mock-up	Prototype	Production
Client's opinions	√	√	√	
Competitive analysis	√			
Expert opinion	√	√	√	
Focus groups	√	√		
Observing users		√	√	√
Measurements			√	√

Tools for Usability Requirements: Mock-up



Tools for Usability Requirements: Focus Group

A focus group is a group interview

- Interviewer
- Potential users
  - Typically 5 to 12
  - Similar characteristics (e.g., same viewpoint)
- Structured set of questions
  - May show mock-ups
  - Group discussions
- Repeated with contrasting user groups

Usability: Accessibility Requirements

Accessibility

Software designers must be prepared for users with poor eyesight, lack of hearing, poor manual dexterity, limited knowledge of English, etc.

Requirements about accessibility (e.g., support for users with disabilities) are most likely to arise in the user interface.

You may have a legal requirement to support people with disabilities.

Example of requirements specification:

> The system must comply with Section 508 of the US Rehabilitation Act. See http://www.section508.gov/

Usability: Equipment Requirements

There may also be requirements to support computers with poor performance, limited screen sizes, bad network connections, etc.

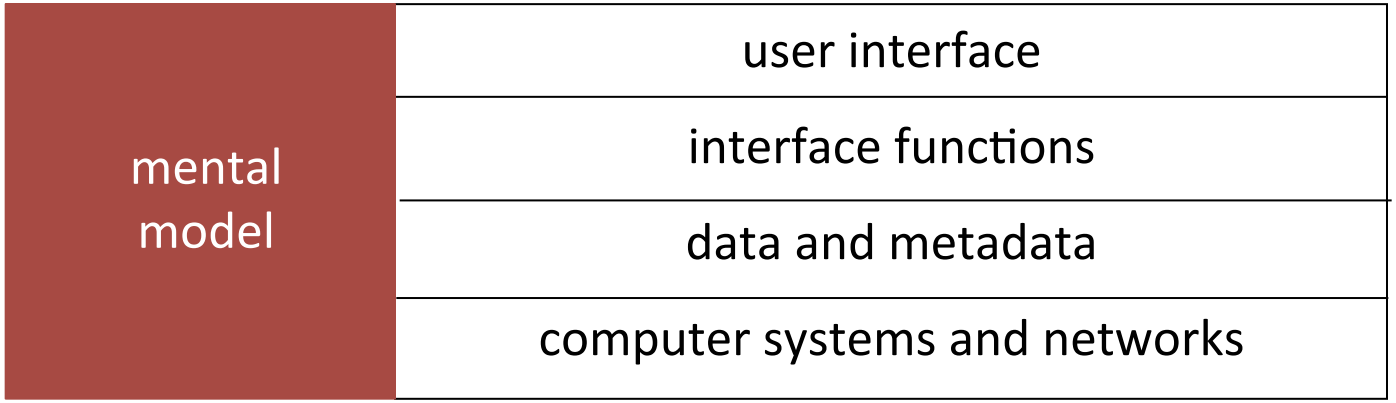
Be explicit about the equipment assumptions that you make and how to handle failures. Do user testing with both good and bad equipment.

Example

> MacMail has a requirement that operations terminate cleanly if the network connection is lost, but its behavior is erratic if the network connection becomes extremely slow, e.g., it will not quit. (2013)

Design from a System Viewpoint

Usability is more than user interface design



Mental Model

A **mental model** is what a user thinks is true about a system, not necessarily what is actually true.

- A mental model should be similar in structure to the system that is represented.
- A mental model allows a user to predict the results of his/her actions.
- A mental model is simpler than the represented system. It includes only enough information to allow reasonable predictions.

A mental model is also called a **conceptual model**.

Examples of Mental Models

The mental model is the user's internal model of what the system provides:

- The **desk top metaphor** -- files and folders
- The **web search model** -- one vast collection of pages, which are searched on request

User Interface Design

The **user interface** is the appearance on the screen and the actual manipulation by the user

- Fonts, colors, logos, key board controls, menus, buttons
- Mouse control or keyboard control
- Conventions (e.g., "back", "help")

Examples of design choices

- Screen space utilization in Adobe Reader.
- Number of snippets per page in web search.

Principles of User Interface Design

User interface design is partly an art, but there are general principles.

- Consistency -- in appearance, controls, and function.
- Feedback -- what is the computer system doing? Why does the user see certain results?
- Users should be able to interrupt or reverse actions.
- Error handling should be simple and easy to comprehend.
- Skilled users should be offered shortcuts; beginners should have simple, well-defined options.

The user should feel in control.

Interface Functions

The **interface functions** determine the actions that are available to the user:

- Select part of an object
- Search a list or sort the results
- View help information
- Manipulate objects on a screen
- Pan or zoom

There may be alternative **user interface designs** for the same **interface functions**, for example:

- Different versions of the MS Windows desktop have most of the same interface functions, but different user interface designs.
- Applications that run on both Windows and Macintosh computers support a one button mouse (Macintosh) or a two button mouse (Windows).

Data and Metadata

Data and metadata stored by the computer system enable the interface functions and the interface design.

- The desktop metaphor has the concept of associating a file with an application. This requires a file type to be stored with each file:
  -- extension to filename (Windows and Unix)
  -- resource fork (Macintosh)
- Effectiveness of searching depends on the type and quality of data that is indexed (free-text, controlled vocabulary, etc.)

Inexperienced clients sometimes ask for interface functions that require additional data or metadata.

Computer Systems and Networks

The **performance**, **reliability** and **predictability** of computer systems and networks is crucial to usability.

Examples

- Instantaneous response time for mouse tracking and echo of key stroke.
- Quality of service for streaming multimedia, e.g., audio has priority over video.
- Response time for transactions, e.g., approve transaction if no reply within five seconds.

Computer Systems and Networks: Requirements

Performance, Reliability, Scalability, Security…

As computer systems improve, users have got more demanding. A response time that is good enough today, may not be good enough five years from now.

Example: Response time

0.1 sec – the user feels that the system is reacting instantaneously

1 sec – the user will notice the delay, but his/her flow of thought stays uninterrupted

10 sec – the limit for keeping the user's attention focused on the dialogue

Computer Systems and Networks: Device-Aware Interfaces

Interfaces must take into account physical constraints of computers and networks:

- How does a desk-top computer differ from a laptop?
- What is special about a smart phone?
- How do you make use of a touch-sensitive screen?
- What works well with a digital camera?

Constraints that the interfaces must allow for:

=> performance of device (e.g., fast or slow graphics)

=> limited form factor (e.g., small display, keyboard)

=> connectivity (e.g., intermittent)

User Interface Design: Graphical Interfaces with Direct Interaction

Most modern user interfaces are "What you see is what you get". The user interacts with computer by manipulating objects on screen (e.g., Windows desktop, iPad) using mouse, keyboard, touch screen, icons, menus, etc.

Advantages of graphical interfaces with direct interaction

- Can be intuitive and easy to learn
- Users get immediate feedback
- Requires minimal typing skills
- Straightforward for casual users
- Icons can be language-independent

Disadvantages of graphical interfaces with direct interaction

- Not suitable for some complex interactions
- May be slow for skilled users
- Difficult to build scripts
- Only suitable for human users

Direct Interaction: Design Considerations

Look:

Characteristics of the appearance that convey information

Feel:

Interaction techniques that provide satisfactory experience

Metaphors and mental models:

Conceptual models, metaphors, icons, but there may not be an intuitive model

Navigation rules:

How to move among data, functions, and activities in a large space

Conventions:

Familiar aspects that do not need extra training – good for users, good for designers

e.g., scroll bars, buttons, gestures, help systems, sliders

Interface Design: Menus

- Easy for users to learn and use
- Certain categories of error are avoided
- Enables context-sensitive help

Major difficulty is structure of large choices

- Scrolling menus (e.g., states of USA)
- Hierarchical
- Associated control panels
- Menus plus command line

Users prefer broad and shallow to deep menu systems

Interface Design: Command Line Interfaces

User interacts with computer by typing commands (e.g., Linux shell script)

- Allows complex instructions to be given to computer
- Facilitates formal methods of specification & implementation
- Skilled users can input commands quickly
- Unless very simple, requires learning or training
- Can be adapted for people with disabilities
- Can be multi-lingual
- Suitable for scripting / non-human clients

Command Line Interfaces and Text-only Menus

Command line interfaces and text-only menus have become largely replaced by graphical interfaces, but are used in special situations:

- Devices with small form factor or other special features, e.g. cell phone, PDA, etc.
- Interfaces for simple tasks with untrained users, e.g. automated bank teller (ATM)

Help System Design

Help system design is difficult

- Must prototype with mixed users
- Must have many routes to same information
- Categories of help:

  => Overview and general information
  => Specific or context information
  => Tutorials (general)
  => Cook books and wizards
  => Emergency ("I am in trouble ...")

Help systems need experienced designers. Schedule plenty of time for development and user testing.

Information Presentation

Simple is often better than fancy

- Text

  precise, unambiguous

  fast to compute and transmit

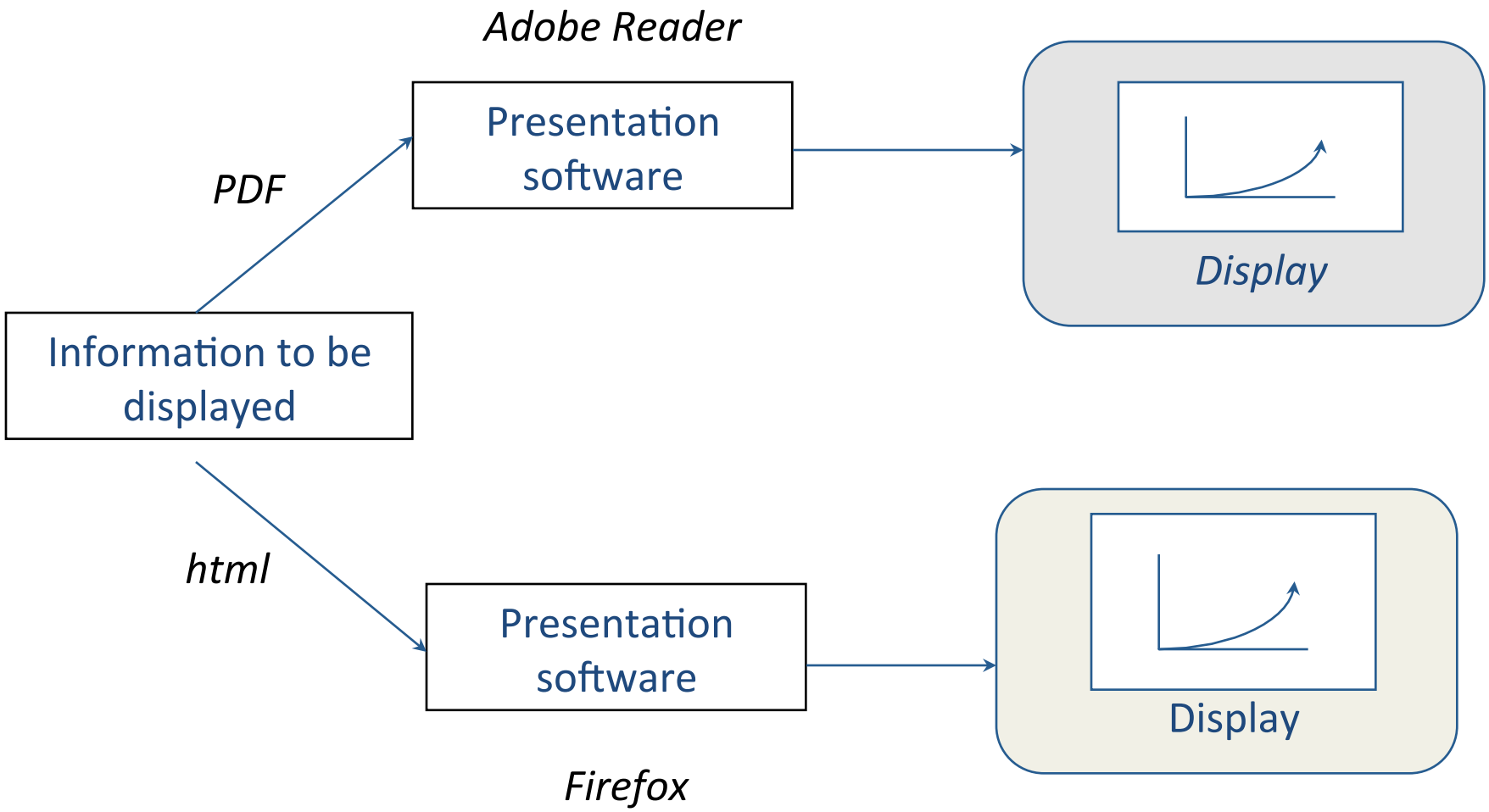
- Graphical interface

  simple to comprehend / learn,
  but icons can be difficult to recognize

  uses of color

  variations show different cases

Separation of Content from Presentation



Usability: Design Tensions in Networked Systems

Designers wish to control what the user sees, but users wish to configure their own environments.

- Client computers and network connections vary greatly in capacity.
- Client software may run on various operating systems, which may not be the current version.
- Accessibility requires that designers do not take control of parameters such as font size.

Be explicit about the assumptions you make about the user's computer, web browser, etc.

In using style sheets, such as CSS, avoid over-riding user preferences.

System Considerations of User Interface Design

- Personal computer cycles are there to be used
- Any network transfer involves delay
- Shared systems have unpredictable performance
- Data validation often requires access to shared data
- Mobile code poses security risks

Usability and Cost

- User interface development may be a major part of a software development project
- Good usability may be expensive in hardware or special software development
- Costs are multiplied if a user interface has to be used on different computers or migrate to different versions of systems

Design users interfaces that can be built with standard tools:

- Programming environments provide powerful user interface toolkits
- Web browsers provide a general purpose user interface where others maintain the user interface software

Changes in User Interface Design

Examples of change: 1995 to today

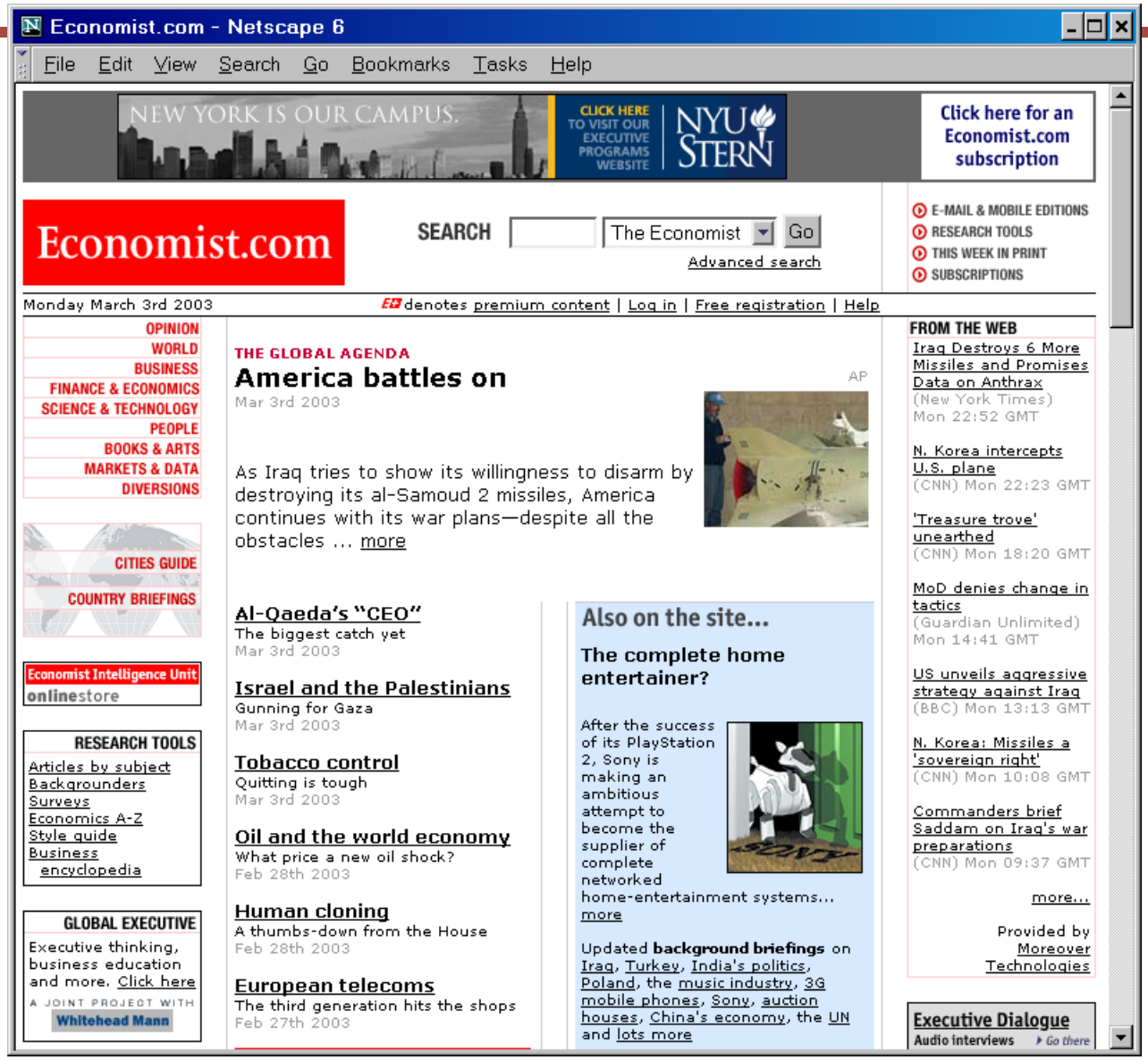
1990

```
SEARCH                          INSPEC Database
-----------------------------------------
Type keywords and press RETURN -- or
enter a command

Default is ADJ: acid free
-----------------------------------------

Set #3:                         acid adj fre
  0 records                     INSPEC Database

Set #4:                         acid adj free
  5 records                     INSPEC Database

Set #5:                         acid and paper
  448 records                   INSPEC Database

Set #6:                         deacidification
  4 records                     INSPEC Database
-----------------------------------------
```

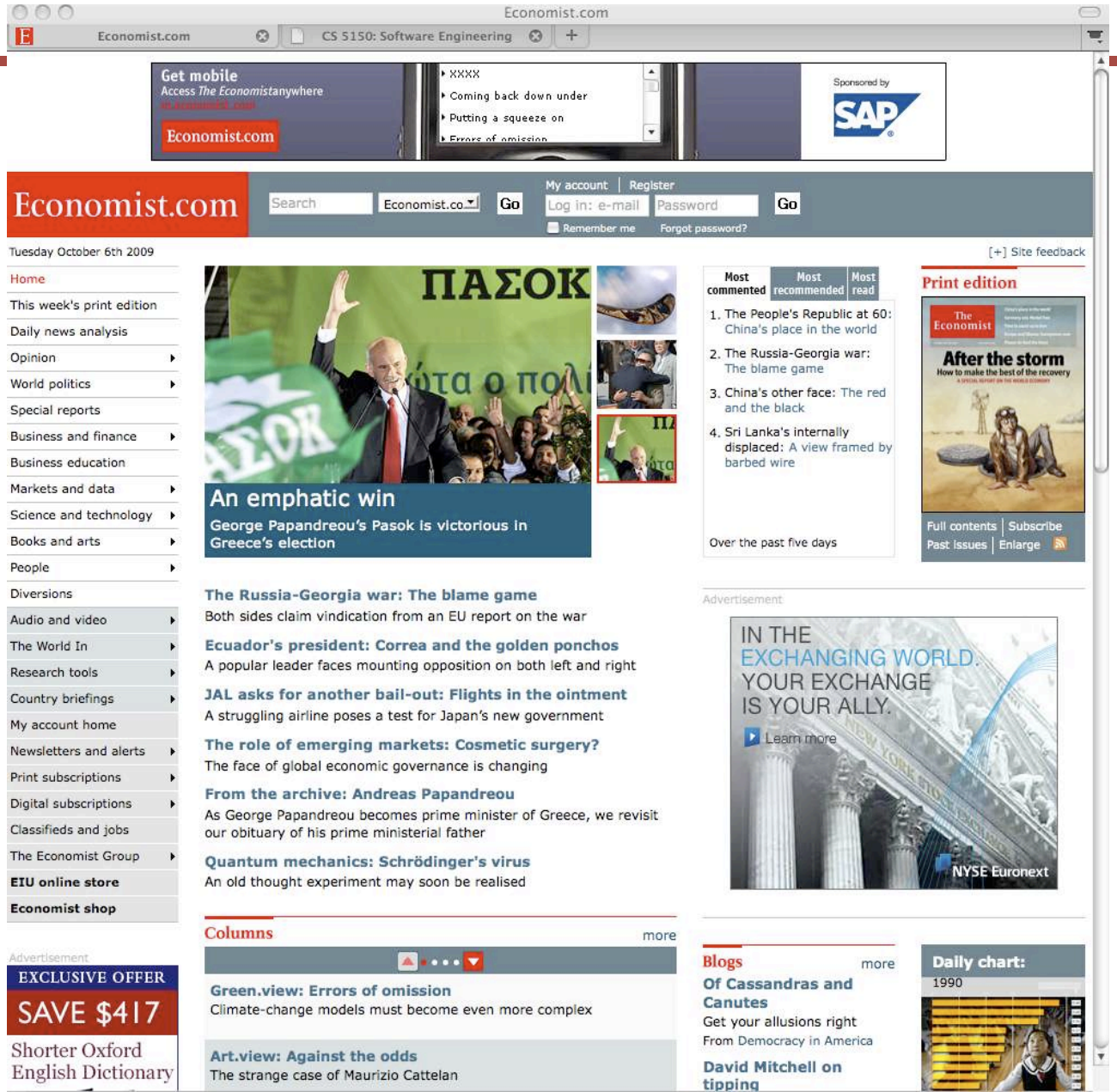
1995


Netscape: The Economist
The Economist
THE INTERNATIONA
WEEKLY JOURNAL C
NEWS, IDEAS, OPINI
AND ANALYSIS
This is the experimental home page of *The Economist*. At the moment, it is the on-line home for our Internet survey, but over time we plan to expand it. Our Los Angeles bureau has a home page of its own, which currently features a survey on Earthquake Engineering (published April 22nd 1995).
The Economist Group has also launched *d.Comm*, a monthly networking magazine published only on the Internet. You can find the first issue at http://www.d-comm.com.
The Accidental Superhighway
A survey of the Internet
Issue of July 1st, 1995

2003


Economist.com - Netscape 6
File Edit View Search Go Bookmarks Tasks Help
NEW YORK IS OUR CAMPUS.
CLICK HERE TO VISIT OUR EXECUTIVE PROGRAMS WEBSITE
NYU STERN
Click here for an Economist.com subscription
Economist.com
SEARCH
The Economist
Go
Advanced search
E-MAIL & MOBILE EDITIONS
RESEARCH TOOLS
THIS WEEK IN PRINT
SUBSCRIPTIONS
Monday March 3rd 2003
denotes premium content | Log in | Free registration | Help
OPINION
WORLD
BUSINESS
FINANCE & ECONOMICS
SCIENCE & TECHNOLOGY
PEOPLE
BOOKS & ARTS
MARKETS & DATA
DIVERSIONS
CITIES GUIDE
COUNTRY BRIEFINGS
Economist Intelligence Unit onlinestore
RESEARCH TOOLS
Articles by subject
Backgrounders
Surveys
Economics A-Z
Style guide
Business encyclopedia
GLOBAL EXECUTIVE
Executive thinking, business education and more. Click here
A JOINT PROJECT WITH Whitehead Mann
THE GLOBAL AGENDA
America battles on
Mar 3rd 2003
AP
As Iraq tries to show its willingness to disarm by destroying its al-Samoud 2 missiles, America continues with its war plans—despite all the obstacles ... more
Al-Qaeda's "CEO"
The biggest catch yet
Mar 3rd 2003
Israel and the Palestinians
Gunning for Gaza
Mar 3rd 2003
Tobacco control
Quitting is tough
Mar 3rd 2003
Oil and the world economy
What price a new oil shock?
Feb 28th 2003
Human cloning
A thumbs-down from the House
Feb 28th 2003
European telecoms
The third generation hits the shops
Feb 27th 2003
Also on the site...
The complete home entertainer?
After the success of its PlayStation 2, Sony is making an ambitious attempt to become the supplier of complete networked home-entertainment systems... more
Updated background briefings on Iraq, Turkey, India's politics, Poland, the music industry, 3G mobile phones, Sony, auction houses, China's economy, the UN and lots more
FROM THE WEB
Iraq Destroys 6 More Missiles and Promises Data on Anthrax
(New York Times)
Mon 22:52 GMT
N. Korea intercepts U.S. plane
(CNN) Mon 22:23 GMT
'Treasure trove' unearthed
(CNN) Mon 18:20 GMT
MoD denies change in tactics
(Guardian Unlimited)
Mon 14:41 GMT
US unveils aggressive strategy against Iraq
(BBC) Mon 13:13 GMT
N. Korea: Missiles a 'sovereign right'
(CNN) Mon 10:08 GMT
Commanders brief Saddam on Iraq's war preparations
(CNN) Mon 09:37 GMT
more...
Provided by Moreover Technologies
Executive Dialogue
Audio interviews Go there

2009


Economist.com
Economist.com
CS 5150: Software Engineering
Get mobile
Access The Economist anywhere
Economist.com
XXXX
Coming back down under
Putting a squeeze on
Sponsored by
SAP
Economist.com
Search
Economist.co
Go
My account | Register
Log in: e-mail
Password
Go
Remember me
Forgot password?
Tuesday October 6th 2009
[+] Site feedback
Home
This week's print edition
Daily news analysis
Opinion
World politics
Special reports
Business and finance
Business education
Markets and data
Science and technology
Books and arts
People
Diversions
Audio and video
The World In
Research tools
Country briefings
My account home
Newsletters and alerts
Print subscriptions
Digital subscriptions
Classifieds and jobs
The Economist Group
EIU online store
Economist shop
ΠΑΣΟΚ
An emphatic win
George Papandreou's Pasok is victorious in Greece's election
Most commented
Most recommended
Most read
1. The People's Republic at 60: China's place in the world
2. The Russia-Georgia war: The blame game
3. China's other face: The red and the black
4. Sri Lanka's internally displaced: A view framed by barbed wire
Over the past five days
Print edition
The Economist
After the storm
How to make the best of the recovery
Full contents | Subscribe
Past issues | Enlarge
The Russia-Georgia war: The blame game
Both sides claim vindication from an EU report on the war
Ecuador's president: Correa and the golden ponchos
A popular leader faces mounting opposition on both left and right
JAL asks for another bail-out: Flights in the ointment
A struggling airline poses a test for Japan's new government
The role of emerging markets: Cosmetic surgery?
The face of global economic governance is changing
From the archive: Andreas Papandreou
As George Papandreou becomes prime minister of Greece, we revisit our obituary of his prime ministerial father
Quantum mechanics: Schrödinger's virus
An old thought experiment may soon be realised
Advertisement
IN THE EXCHANGING WORLD, YOUR EXCHANGE IS YOUR ALLY.
Learn more
NYSE Euronext
Columns
more
Green.view: Errors of omission
Climate-change models must become even more complex
Art.view: Against the odds
The strange case of Maurizio Cattelan
Blogs
more
Of Cassandras and Canutes
Get your allusions right
From Democracy in America
David Mitchell on tipping
Daily chart:
1990
Advertisement
EXCLUSIVE OFFER
SAVE $417
Shorter Oxford English Dictionary

2001


Yahoo! - Netscape 6
File Edit View Search Go Bookmarks Tasks Help
http://www.yahoo.com/
Home Bookmarks
Calendar Messenger Check Email
YAHOO!
What's New Personalize Help
new! Yahoo! Personals
find the one for you
Instant Stock Alerts
Download Yahoo! Messenger
Build a Store
free 10-day trial
Search advanced search
Yahoo! Travel - Air, Car, Hotel, Vacations and Cruises
Shop Auctions · Autos · Classifieds · Shopping · Travel · Yellow Pgs · Maps Media Finance/Quotes · News · Sports · Weather
Connect Careers · Chat · Clubs · GeoCities · Greetings · Mail · Members · Messenger · Mobile · Personals · People Search · Photos
Personal Addr Book · Briefcase · Calendar · My Yahoo! · PayDirect Fun Games · Kids · Movies · Music · Radio · TV more...
Find and Buy Anything on Yahoo!
Auctions
· Charity
· Michael Jordan
· Barry Bonds
· Morgan Dollars
· Longaberger
Classifieds
· Autos
· Careers
· Real Estate
· Rentals
· Personals
Shopping
· Apparel
· Books
· Computers
· Electronics
· more depts
Features
· Halloween
· Store Builder
· Auctions Booth
· Deals of the Week
· Consumer Reports
Got something to sell? Auction it now!
Arts & Humanities
Literature, Photography...
News & Media
Full Coverage, Newspapers, TV...
Business & Economy
B2B, Finance, Shopping, Jobs...
Recreation & Sports
Sports, Travel, Autos, Outdoors...
Computers & Internet
Internet, WWW, Software, Games...
Reference
Libraries, Dictionaries, Quotations...
Education
College and University, K-12...
Regional
Countries, Regions, US States...
Entertainment
Cool Links, Movies, Humor, Music...
Science
Animals, Astronomy, Engineering...
Government
Elections, Military, Law, Taxes...
Social Science
Archaeology, Economics, Languages...
Health
Medicine, Diseases, Drugs, Fitness...
Society & Culture
People, Environment, Religion...
powered by COMPAQ
In the News
· U.S. jets pound Kabul
· Israel poses ultimatum to Arafat
· Fla., NYC anthrax strains linked; House shut for tests after scare
· NASA chief Goldin resigns
· Novelist Carey wins Booker Prize
· MLB playoffs · NHL · NBA · NFL
more...
Marketplace
· MLB Wives Relief Auction
· Kodak EasyShare Digital Camera - only $199.95
· Spend $30 at Hallmark - get $10 back
· Las Vegas for 2 nights - air and hotel from $140
· Y! Careers - find a job, post your resume
Broadcast Events
· FinanceVision - live market coverage M-F 9am-5pm ET
· Sting concert in Tuscany
· The Taliban - National Geographic Today
more...
Inside Yahoo!
· GeoCities - build your own website
· Make Yahoo! your home page
Document: Done (0.771 secs)

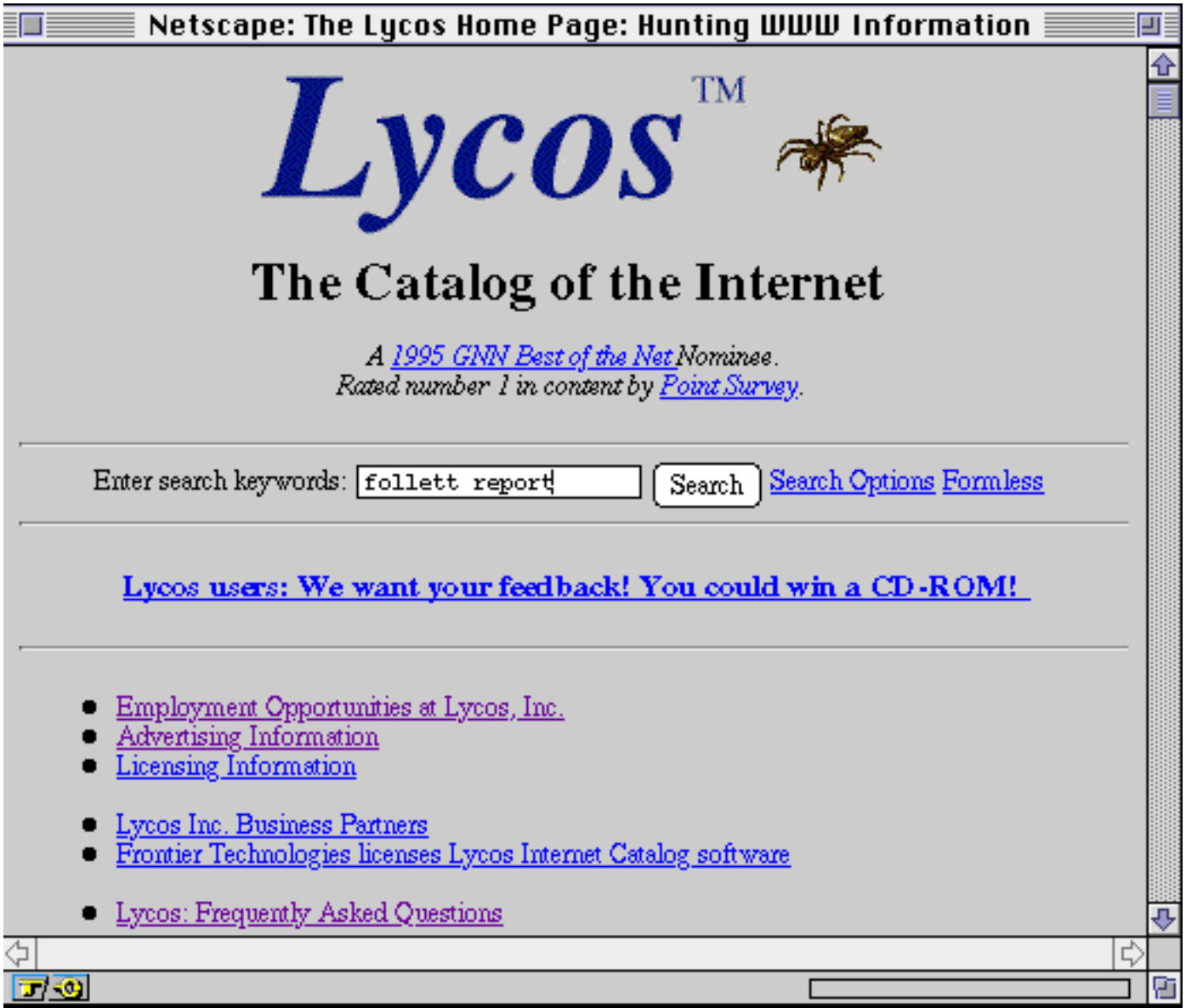
2003


Yahoo! - Netscape 6
File Edit View Search Go Bookmarks Tasks Help
Personalize Finance Shop YAHOO! Email Messenger HotJobs Help
Yahoo! Shopping - Computers, Electronics, Apparel, Flowers, Books, Home & Garden, More...
Search
advanced search
most popular
New! Y! Messenger Enterprise Edition - Business-class IM
Shop Auctions, Autos, Classifieds, Real Estate, Shopping, Travel
Find HotJobs, Maps, People Search, Personals, Yellow Pages
Connect Chat, GeoCities, Greetings, Groups, Mail, Messenger, Mobile
Organize Addresses, Briefcase, Calendar, My Yahoo!, PayDirect, Photos
Fun Games, Horoscopes, Kids, Movies, Music, TV
Info Finance, Health, News, Sports, Weather
More Yahoo!...
The New Choice for Dial-up Internet Access.
NEW! Our simple switching process transfers emails, addresses, bookmarks and more.
SBC YAHOO! DIAL
Click here to switch!
Y! Business Services - Visit the Yahoo! Small Business Center
Web Hosting
Domain Registration
Marketing Services
E-commerce
Business Mail
Sell on Yahoo!
Web Site Directory - Sites organized by subject
Suggest your site
Business & Economy
B2B, Finance, Shopping, Jobs...
Regional
Countries, Regions, US States...
Yahoo! Autos
Free Quotes, Research, Compare, Buy New, Buy Used, Auto Loans
2003 MINI
Personal Assistant
Sign In
Sign up to personalize Yahoo! - learn more
In The News
8:12pm, Wed Mar 5
Papal emissary to Bush: Iraq war 'unjust'
U.S., Britain escalate air patrols over Iraq
FBI: Qaeda capture could spark more attacks
Study cites effects of oil drilling in Alaska
U.S. students stage walkout to protest war
Money woes drive some states to gambling
Ore. assisted suicides more than double
NCAA Hoops · NBA · Broncos sign Plummer
News - Tech - Sports - Stocks - Weather
Marketplace
PC Sale at Dell!
Free monitor upgrade with select Dell PCs. Expires 3/5. Details here.
Complimentary Beauty Sample with any purchase at Gloss
Save on Contact Lenses, plus receive free

2009


Yahoo!
Yahoo!
CS 5150: Software Engineering
Take a sneak peek at the new Yahoo! homepage
Try it now!
Close
YAHOO!
Web | Images | Video | Local | Shopping | more
Search:
Web Search
Yahoo! Home
My Yahoo!
Oct 6, 2009
Page Options
Answers
Autos
Finance
Games
Groups
HotJobs
Maps
Mobile
Movies | TV
Music
OMG
Personals
Real Estate
Shine
Shopping
Sports
Travel
Yellow Pages
More Yahoo! Services
Small Business
• Get a Web Site
• Domain Names
• Sell Online
• Search Ads
Featured Services
• Downloads
• Health
• Kids
• Mail Plus
• Y! International
Featured
Entertainment
Sports
Life
Most-stressed U.S. states
Despite signs of economic recovery, the hardest-hit regions continue to struggle.
» Foreclosure hotbeds
• Employers begin rehiring the laid off
Coping with unemployment stress
Most economically stressed states
HS football coach suspends himself
'Transformers' director confirms release date
High-tech pioneers win Nobel Prize in physics
» More: Featured | Buzz
News
World
Local
Finance
As of 12:42 p.m. EST
• Pakistan braces for more bombings ahead of Taliban offensive
• Key suspect in Rwanda's genocide is arrested in Uganda
• Suspect in Yale student slaying in court, hearing set
• GOP back off scolding Democrat over 'die quickly' comment
• Too tired to fly: European pilots call for shorter shifts
• First look at Air Force's high-tech equipment in Afghanistan
• MTV to air DJ AM's addiction series, 'Gone too Far'
» More: News | Popular | Odd News
Markets: Dow: +1.6% Nasdaq: +1.9%
Sponsored by: Scottrade
Real-Time Quotes:
Go
Marketplace
How Strong is Your Score?
A bad credit score is below 598. See yours instantly for $0. Checking won't affect your score. By Experian®
Mortgage rates drop. As low as 3.84% APR. Lock in a low APR before rates rise. $200k for $912/mo. LendingTree®
A bad credit score is 598. Click to see yours instantly for $0. Checking won't affect score. By Experian®
Check your mail status: Sign In
Free mail: Sign Up
Mail
Messenger
Puzzles
Weather
Events
Horoscopes
The 60-Day Satisfaction Guarantee.
GMC
MAY THE BEST CAR WIN.™
Click here for details and limitations »
May The Best Car Win - Replay Ad - Ad Feedback
Inside Yahoo! HotJobs
Hit the job jackpot
• Earn big bucks with no graduate degree
• Recession-proof jobs that pay
• Surprising six-figure jobs
• Get good pay without a 4-year degree
Pulse - What Yahoos Are Into
Popular Luxury Car Previews
• Aston Martin Rapide
• Rolls-Royce Ghost
• Mercedes-Benz SLS AMG
• Saab 9-5
• Bentley Mulsanne
• BMW 5 Series Gran Turismo

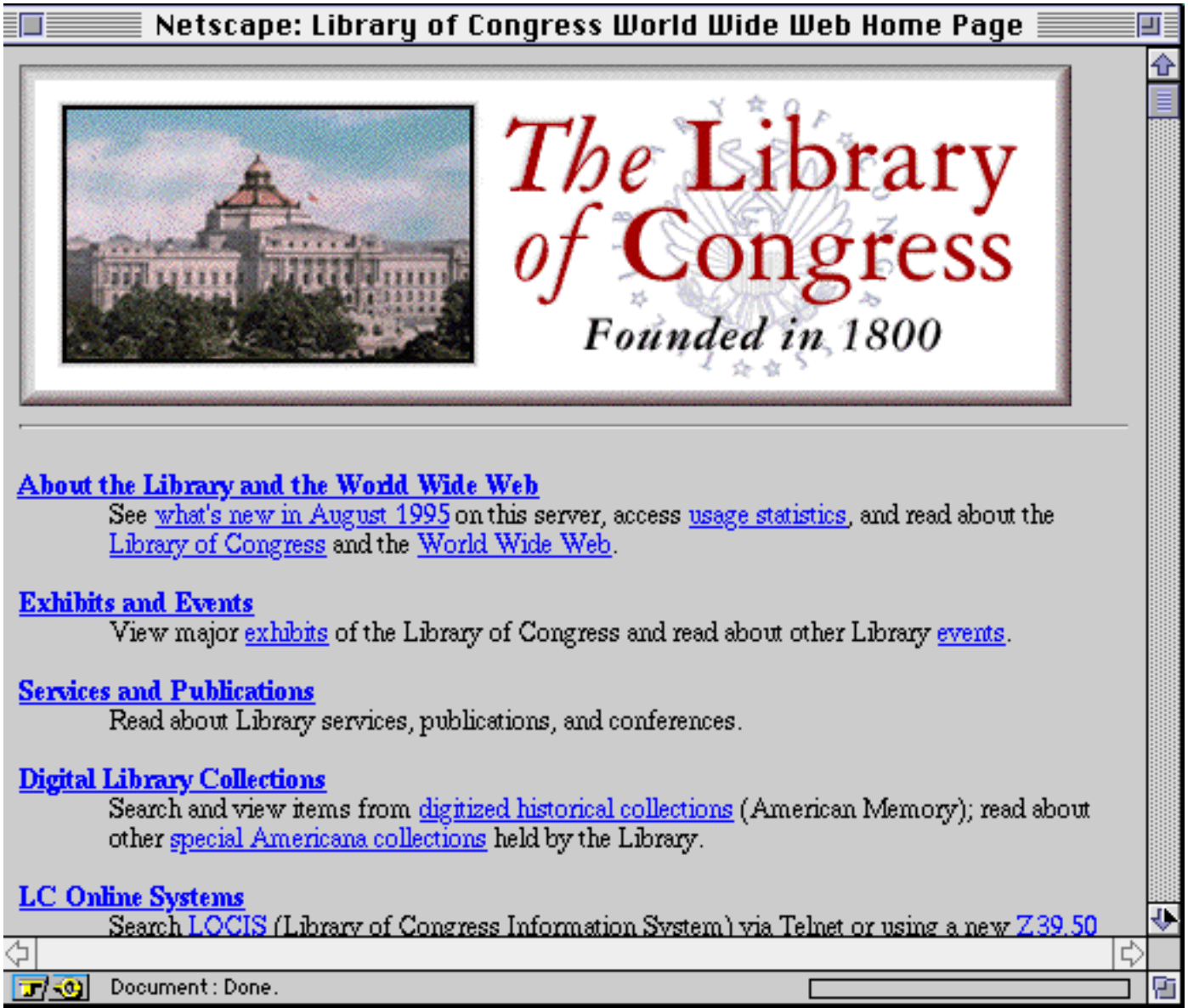
1995


Netscape: The Lycos Home Page: Hunting WWW Information
Lycos™
The Catalog of the Internet
A 1995 GNN Best of the Net Nominee.
Rated number 1 in content by Point Survey.
Enter search keywords:
follett report
Search
Search Options
Formless
Lycos users: We want your feedback! You could win a CD-ROM!
Employment Opportunities at Lycos, Inc.
Advertising Information
Licensing Information
Lycos Inc. Business Partners
Frontier Technologies licenses Lycos Internet Catalog software
Lycos: Frequently Asked Questions

2006


Google
Personalized Home | Sign in
Google
Web Images Groups News Froogle Local Scholar more »
Advanced Search
Preferences
Language Tools
Google Search I'm Feeling Lucky
Advertising Programs - Business Solutions - About Google
©2006 Google

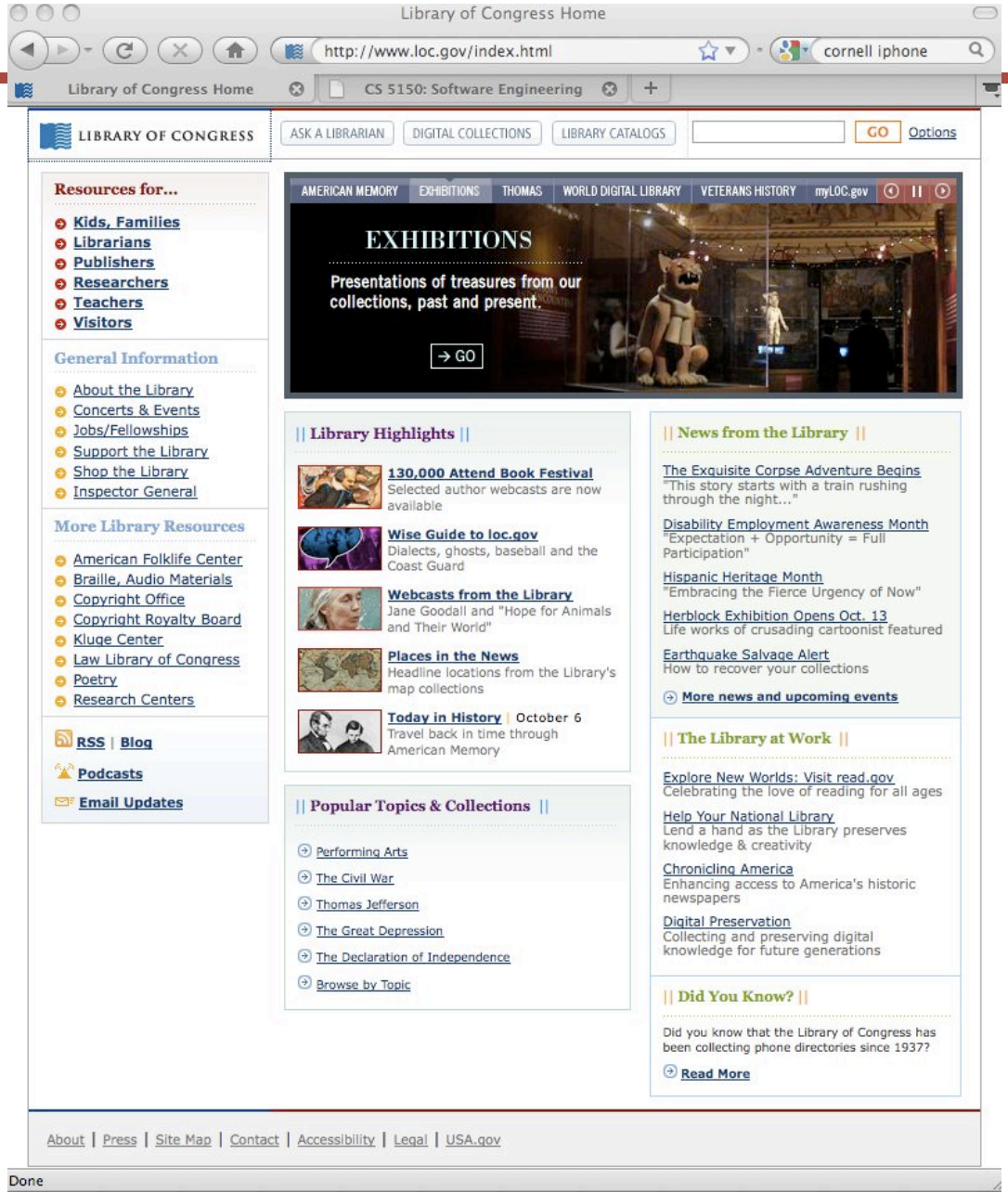
1995


Netscape: Library of Congress World Wide Web Home Page
The Library of Congress
Founded in 1800
About the Library and the World Wide Web
See what's new in August 1995 on this server, access usage statistics, and read about the Library of Congress and the World Wide Web.
Exhibits and Events
View major exhibits of the Library of Congress and read about other Library events.
Services and Publications
Read about Library services, publications, and conferences.
Digital Library Collections
Search and view items from digitized historical collections (American Memory); read about other special Americana collections held by the Library.
LC Online Systems
Search LOCIS (Library of Congress Information System) via Telnet or using a new Z39.50
Document : Done.

2003


The Library of Congress - Netscape 6
File Edit View Search Go Bookmarks Tasks Help
The Library of Congress
SEARCH
more than a library
Get It Online . . . Words, Pictures & Sound
American Memory
US History & Culture
THOMAS
Legislative Information
Global Gateway
World Culture & Resources
Exhibitions
Online Galleries
America's Library
Log On, Play Around
Learn Something
Wise Guide
It's Fun to Know History
More Online Collections...
Find It ...
Search Our Catalogs
Advanced Search
Research Centers
Index A-Z
Site Map
Ask a Librarian
Today in History
March 3
Especially For ...
Researchers
Law Researchers
Librarians & Archivists
Teachers
Kids & Families
Publishers
Persons with Disabilities
Blind Persons
Newcomers
Information & Services
US Copyright Office
National Digital Preservation Program
About the Library
Visit / Tour
Philanthropy
Jobs / Fellowships
Shop
News & Events
Preserving America's Digital Heritage
Library to Lead Infrastructure Effort
Juilliard String Quartet
Concerts February 26 and 28
Featured Cybercast
Abraham Lincoln Symposium
MORE
Complete News & Events
The Library of Congress
Contact Us
Please Read Our Legal Notices

2009


Library of Congress Home
http://www.loc.gov/index.html
cornell iphone
Library of Congress Home
CS 5150: Software Engineering
LIBRARY OF CONGRESS
ASK A LIBRARIAN
DIGITAL COLLECTIONS
LIBRARY CATALOGS
GO
Options
Resources for...
Kids, Families
Librarians
Publishers
Researchers
Teachers
Visitors
General Information
About the Library
Concerts & Events
Jobs/Fellowships
Support the Library
Shop the Library
Inspector General
More Library Resources
American Folklife Center
Braille, Audio Materials
Copyright Office
Copyright Royalty Board
Kluge Center
Law Library of Congress
Poetry
Research Centers
RSS | Blog
Podcasts
Email Updates
AMERICAN MEMORY
EXHIBITIONS
THOMAS
WORLD DIGITAL LIBRARY
VETERANS HISTORY
myLOC.gov
EXHIBITIONS
Presentations of treasures from our collections, past and present.
→ GO
|| Library Highlights ||
130,000 Attend Book Festival
Selected author webcasts are now available
Wise Guide to loc.gov
Dialects, ghosts, baseball and the Coast Guard
Webcasts from the Library
Jane Goodall and "Hope for Animals and Their World"
Places in the News
Headline locations from the Library's map collections
Today in History | October 6
Travel back in time through American Memory
|| Popular Topics & Collections ||
Performing Arts
The Civil War
Thomas Jefferson
The Great Depression
The Declaration of Independence
Browse by Topic
|| News from the Library ||
The Exquisite Corpse Adventure Begins
"This story starts with a train rushing through the night..."
Disability Employment Awareness Month
"Expectation + Opportunity = Full Participation"
Hispanic Heritage Month
"Embracing the Fierce Urgency of Now"
Herblock Exhibition Opens Oct. 13
Life works of crusading cartoonist featured
Earthquake Salvage Alert
How to recover your collections
More news and upcoming events
|| The Library at Work ||
Explore New Worlds: Visit read.gov
Celebrating the love of reading for all ages
Help Your National Library
Lend a hand as the Library preserves knowledge & creativity
Chronicling America
Enhancing access to America's historic newspapers
Digital Preservation
Collecting and preserving digital knowledge for future generations
|| Did You Know? ||
Did you know that the Library of Congress has been collecting phone directories since 1937?
Read More
About | Press | Site Map | Contact | Accessibility | Legal | USA.gov
Done

1995


Netscape: D-Lib, August 1995
d-lib magazine
The Magazine of the Digital Library Forum
August 1995
editorial
From the Editor: When is honesty the best policy?
To the Editor: More ideas about the future
From D-Lib Forum: Activities and resources
stories and briefings
Content Ratings and Other Third-Party Value-Added Information: Defining an Enabling Platform. Martin Röscheisen, Terry Winograd, and Andreas Paepcke, Stanford Integrated Digital Library Project
Image Browsing in the Alexandria Digital Library (ADL) Project. B.S. Manjunath, Alexandria Digital Library Project
The Global Change Data and Information System-Assisted Search for Knowledge (GC-ASK)

2006

D-Lib Magazine

D-Lib® Magazine

Search Go

About D-Lib Magazine
Current Issue
- Table of Contents
- Featured Collection
- In Brief
- Clips & Pointers

Indexes
- Back Issues
- Author Index
- Title Index

Subscriptions
Search Guidelines
Mirror Sites
Author Guidelines
Contact D-Lib
•••
DOI
10.1045/dlib.magazine

ISSN
1082-9873
•••
RSS D-Lib via RSS

In the Current Issue

Full-length Features

February 2006
Vol. 12 No. 2
Table of Contents

•••

EDITORIAL
Unrestricted Access
by Bonita Wilson, *CNRI*

•••

LETTERS
To the Editor

•••

COMMENTARY
Facilitating Scholarly Communication in African Studies
by Titia van der Werf-Davelaar, *African Studies Centre, Leiden*
doi:10.1045/february2006-vanderwerf

•••

ARTICLES
ADL-R: The First Instance of a CORDRA Registry
by Henry Jerez, Giridhar Manepalli, Christophe Blanchi, and Laurence W. Lannom, *Corporation for National Research Intiatives*
doi:10.1045/february2006-jerez

FeDCOR: An Institutional CORDRA Registry
by Giridhar Manepalli and Henry Jerez, *Corporation for National Research Initiatives*; and Michael L. Nelson, *Old Dominion University*
doi:10.1045/february2006-manepalli

A Research Library Based on the Historical Collections of the Internet Archive
by William Y. Arms, Selcuk Aya, Pavel Dmitriev, Blazej Kot, Ruth Mitchell, and Lucia Walle, *Cornell University*
doi:10.1045/february2006-arms

Also This Month

Digital Collections

FEATURED COLLECTION
The Lilly Library, Indiana University

The combined resources of the University Library's Special Collections and the private library of J. K. Lilly, Jr., including rare books, individual manuscripts and sheet music.

[Courtesy of Lilly Library. Used with Permission.]

Digital Library Community Activities

In Brief
Short items of current awareness.

In the News
Recent press releases and announcements.

Clips & Pointers
Documents, deadlines, calls for participation.

Archives

Back Issues and Indexes

Back Issues
Complete archive of D-Lib Magazine.

Author Index
Alphabetical list of authors and contributors.

Title Index
Alphabetical list of content by title.

Additional Links

Other Resources

Ready Reference
Links to other digital library sites.

Meetings, Conferences, Workshops
Calendar of activities associated with digital libraries research and technologies.

D-Lib Forum
Supporting the community developing the technology of the global digital library.

2013

craigslist

post to classifieds
my account

search craigslist
for sale >

event calendar

S	M	T	W	T	F	S
18	19	20	**21**	22	23	24
25	26	27	28	29	30	31
1	2	3	4	5	6	7
8	9	10	11	12	13	14

help, faq, abuse, legal
avoid scams & fraud
personal safety tips
terms of use
system status

about craigslist
craigslist is hiring in sf
craigslist open source

ithaca w

community

activities
artists
childcare
general
groups
pets
events
lost+found
musicians
local news
politics
rideshare
volunteers
classes

personals

strictly platonic
women seek women
women seeking men
men seeking women
men seeking men
misc romance
casual encounters
missed connections
rants and raves

discussion forums

adopt
apple
arts
atheist
autos
beauty
bikes
celebs
comp
haiku
health
help
history
housing
jobs
jokes
kink
legal
pets
philos
photo
politics
psych
queer
recover
religion
romance

housing

apts / housing
rooms / shared
sublets / temporary
housing wanted
housing swap
vacation rentals
parking / storage
office / commercial
real estate for sale

for sale

antiques
baby+kid
barter
bikes
boats
books
business
computer
free
furniture
general
household
jewelry
materials
rvs+camp
sporting
tickets
appliances
arts+crafts
atv/utv/sno
auto parts
beauty+hlth
cars+trucks
cds/dvd/vhs
cell phones
clothes+acc
collectibles
electronics
farm+garden
garage sale
heavy equip
motorcycles
music instr
photo+video

jobs

accounting+finance
admin / office
arch / engineering
art / media / design
biotech / science
business / mgmt
customer service
education
food / bev / hosp
general labor
government
human resources
internet engineers
legal / paralegal
manufacturing
marketing / pr / ad
medical / health
nonprofit sector
real estate
retail / wholesale
sales / biz dev
salon / spa / fitness
security
skilled trade / craft
software / qa / dba
systems / network
technical support
transport
tv / film / video