



THE NATIONAL SCIENCE DIGITAL LIBRARY

# Digital Libraries and the Future of Academic Libraries



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NSDL



# Overview of the NSDL: *Front Door*

<[www.nsd.org](http://www.nsd.org)>

The screenshot shows the NSDL website interface. At the top, the browser address bar displays the URL: [http://nsdl.org/tag.3829a399662724e8.render.userLayoutRootNode.target.n7.uP?cw\\_xml=http://content.nsd.org/exhibits/view\\_exhibits/index.html](http://nsdl.org/tag.3829a399662724e8.render.userLayoutRootNode.target.n7.uP?cw_xml=http://content.nsd.org/exhibits/view_exhibits/index.html). The browser toolbar includes Google, NSDL template, Search Web, Search Site, PageRank, Page Info, Up, Highlight, NSDL, and template buttons. The website header features the NSDL logo and the text: "The comprehensive source for science, technology, engineering and mathematics education. Funded by the National Science Foundation." Below the header is a navigation menu with links for MAIN, SEARCH, BROWSE, EXHIBITS, SPECIALIZED PORTALS, HELP, and ABOUT NSDL. The main content area is divided into three sections: "Search the Library" with a search input field and a "Search" button; "Visit NSDL Exhibits" with a list of featured collections and services, including a "Science Pictures" section with a portrait of a woman; and "New in the Library" with a list of recent additions, including "Planet Math" and "Librarians' Ind.-Intern.". The footer contains a "Contact NSDL" link and the text "Powered by uPortal".

Address [http://nsdl.org/tag.3829a399662724e8.render.userLayoutRootNode.target.n7.uP?cw\\_xml=http://content.nsd.org/exhibits/view\\_exhibits/index.html](http://nsdl.org/tag.3829a399662724e8.render.userLayoutRootNode.target.n7.uP?cw_xml=http://content.nsd.org/exhibits/view_exhibits/index.html) Go Links >>

Google NSDL template Search Web Search Site PageRank Page Info Up Highlight NSDL template

INITIAL VERSION LOGIN | REGISTRATION

**NSDL** THE NATIONAL SCIENCE DIGITAL LIBRARY

The comprehensive source for science, technology, engineering and mathematics education.  
Funded by the National Science Foundation.

MAIN SEARCH BROWSE EXHIBITS SPECIALIZED PORTALS HELP ABOUT NSDL

### Search the Library

Search:  **Search**

Go to [Advanced Search](#)

### Visit NSDL Exhibits

- Featured Collections
- Featured Services
- Science Pictures
- News Collections Display
- Look into the Future
- Start-up: New NSDL Project Diary
- Information Expedition with Bill Nye the Science Guy



### New in the Library

OPEN CLOSE

- Planet Math
- Librarians' Ind.-Intern.  
The science links of the Librarians' Index to the Internet.

**SAMPLES FROM THE COLLECTION:**  
**Sample item 1 from Librarians' Ind.**  
**Sample item 2 from Librarians' Ind.**

ALSO

- Ask a Scientist
- SciCentral - SciQuest
- Natural Hist. Museum of LA
- Sun-Earth Connection

Contact NSDL Powered by uPortal

Done Internet

# Overview of the NSDL: *Personalized Portals*

The screenshot shows a web browser window displaying the NSDL website. The address bar shows a URL from nsdl.org. The page has a navigation menu with options like MAIN, SEARCH, COLLECTIONS, EXHIBITS, SPECIALIZED PORTALS, HELP, and ABOUT NSDL. The main content area is titled 'Specialized Portals in the NSDL' and includes a paragraph explaining that specialized portals are considered 'collections' for metadata creation and management. It also features a section titled 'What's the Difference Between a Portal and a Web Site?' which explains that a portal is an entry point to an aggregation of many decentralized online resources. A list of 'Featured Collections' is shown on the right, including iLUMINA, AV Atmospheric Visualization DL, HEAL Health Education Assets Library, GSDL Gender and Science DL, TD Teachers Domain, MATHFORUM Math Education at Drexel University, ERIC Education Resources Info Center, PKAL Project Kaleidoscope, CE Columbia Earthscape, ARCHON Archon Physics DL, ENC Eisenhower National Clearinghouse, MTN Michigan Teacher Network, BDE Building the Digital Earth, DLESE DL for Earth System Education, ADL Alexandria DL, and CITIDEL Computing and Info Tech DL. The browser's status bar at the bottom shows the URL http://www.ilumina-dlib.org/ and the Internet icon.

Address [http://nsdl.org/tag.f869fca780058233.render.userLayoutRootNode.uP?uP\\_root=root&uP\\_sparam=activeTab&activeTab=5](http://nsdl.org/tag.f869fca780058233.render.userLayoutRootNode.uP?uP_root=root&uP_sparam=activeTab&activeTab=5) Go Links >>

Google Search Web Search Site News PageRank Page Info Up Highlight

INITIAL VERSION LOGIN | REGISTRATION

**NSDL** The comprehensive source for science, technology, engineering and mathematics education. Funded by the National Science Foundation.  
THE NATIONAL SCIENCE DIGITAL LIBRARY

MAIN SEARCH COLLECTIONS EXHIBITS SPECIALIZED PORTALS HELP ABOUT NSDL

## Specialized Portals in the NSDL

Specialized portals are considered "collections" for the purpose of metadata creation and management in the NSDL. Communities of portal builders may use NSDL portal components to create specialized library services, or develop portal functionality using independent portal systems.

### What's the Difference Between a Portal and a Web Site?

A web site is a relatively static collection of online information that is usually maintained and updated in a central location. A portal is an entry point to an aggregation of many decentralized online resources including online services for using those resources. A portal is a web system of content and applications rather than a simple HTML page.

Currently there are three NSDL Specialized Portals under construction that will provide users with unique views into the Library:

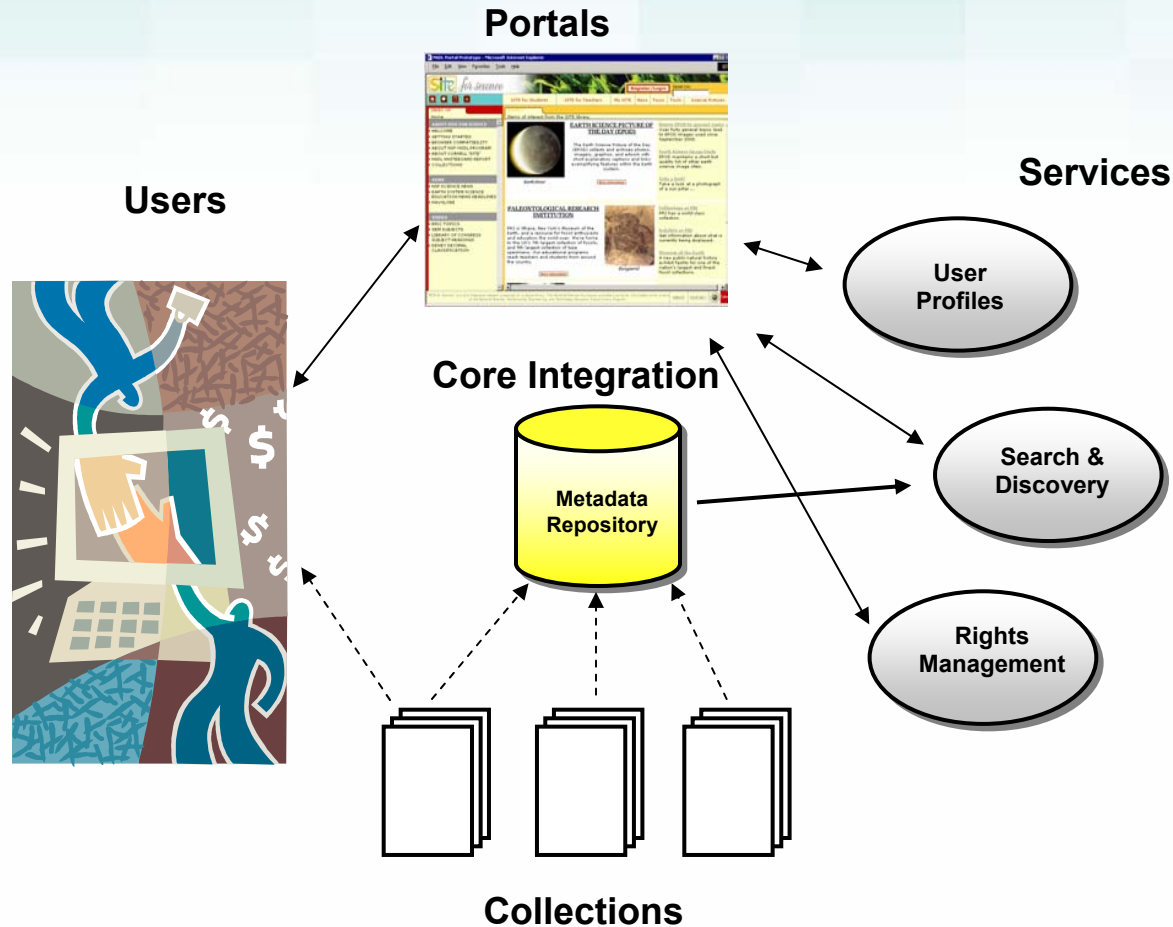
- Using Data in the Classroom**  
Engaging students in using data to address scientific questions has long been an integral aspect of science education. This site provides information and discussion for educators and resource developers interested in effective teaching methods and pedagogical approaches for using data in the classroom.  
Portal functionality will be added to **Using Data in the Classroom** in future Library releases.
- The NSDL Educators Portal**

## Featured Collections

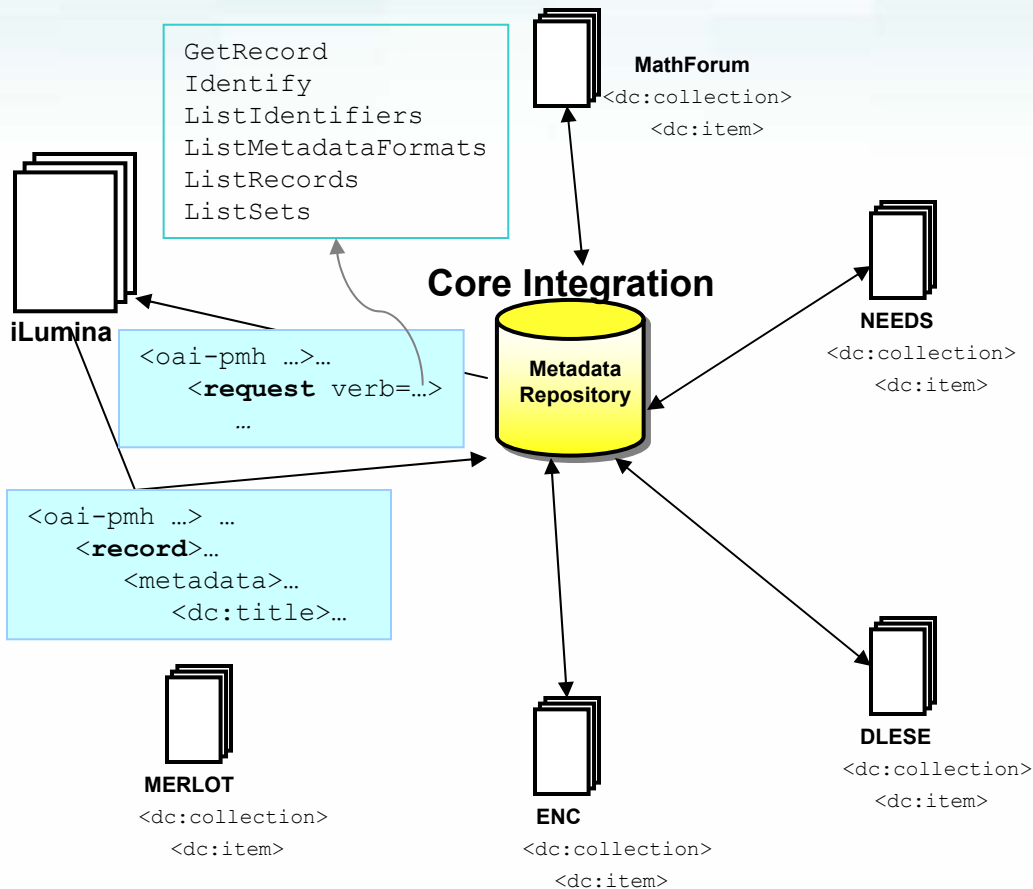
- iLUMINA**  
Educational Resources for Mathematics and Sciences
- AV** Atmospheric Visualization DL
- HEAL** Health Education Assets Library
- GSDL** Gender and Science DL
- TD** Teachers Domain
- MATHFORUM** Math Education at Drexel University
- iLUMINA** Science and Mathematics
- ERIC** Education Resources Info Center
- PKAL** Project Kaleidoscope
- CE** Columbia Earthscape
- ARCHON** Archon Physics DL
- ENC** Eisenhower National Clearinghouse
- MTN** Michigan Teacher Network
- BDE** Building the Digital Earth
- DLESE** DL for Earth System Education
- ADL** Alexandria DL
- CITIDEL** Computing and Info Tech DL

http://www.ilumina-dlib.org/ Internet

# NSDL's Architecture for Distributed Resource Sharing



# NSDL uses the OAI Protocol for Metadata Harvesting (OAI-PMH) for Resource Sharing



## Standards for NSDL Metadata export/import:

- Dublin Core metadata schema (see <http://dublincore.org/>)
- OAI metadata harvesting protocol for data provider/harvester (see <http://www.openarchives.org/OAI/openarchivesprotocol.html>)

# iLumina: Front Door

<[www.ilumina-dlib.org](http://www.ilumina-dlib.org)>

The screenshot shows a web browser window displaying the iLumina website. The browser's address bar shows the URL [www.ilumina-dlib.org](http://www.ilumina-dlib.org). The website header features the iLumina logo and the tagline "Educational Resources for Science & Mathematics". A navigation menu includes links for Home, Login, Advanced Search, Browse, Contribute, and Collections. A search bar with a "Go!" button is located in the top right. The main content area contains a paragraph describing iLumina as a digital library of sharable undergraduate teaching materials. To the right of this text is the NSDL logo (The National Science Digital Library) and a login box with fields for email and password, and a "Log in" button. Below the text is a row of five small images representing different scientific fields: CHM (Chemistry), BIO (Biology), CSC (Computer Science), MAT (Mathematics), and PHY (Physics). At the bottom, a section titled "Recently added resources" lists four items: Spingidae Indices by Nation, Spingidae of the United States, Spingidae of the Americas, and Forest Simulator Software and Curriculum Materials.

Google Search Web Search Site News PageRank Page Info Up Highlight

**iLumina** Educational Resources for Science & Mathematics



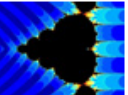
Quick Search

Home | Login | Advanced Search | Browse | Contribute | Collections

**iLumina** is a digital library of sharable undergraduate teaching materials for chemistry, biology, physics, mathematics, and computer science. It is designed to quickly and accurately connect users with the educational resources they need. These resources range in type from highly granular objects such as individual images and video clips to entire courses. Resources in iLumina are cataloged with IMS-compliant metadata, which captures both technical and education-specific information about each resource. An advanced search engine, quick search feature, and browse utility provide multiple methods for accessing resources in the library. iLumina contains thousands of educational resources and several virtual collections. Please feel free to contribute your own resources to iLumina by becoming a **registered** user.

**NSDL**  
THE NATIONAL SCIENCE DIGITAL LIBRARY

**Login**  
Click [here](#) to register.  
email:   
Password:

CHM    BIO    CSC    MAT    PHY

**Recently added resources**

- **Spingidae Indices by Nation**
- **Spingidae of the United States**
- **Spingidae of the Americas**
- **Forest Simulator Software and Curriculum Materials**

# iLumina: Rich Resource Descriptions

The screenshot displays the iLumina website interface. At the top, the iLumina logo is on the left, and a 'Quick Search' box with a 'Go!' button is on the right. Below the logo, the tagline 'Educational Resources for Science & Mathematics' is visible. A navigation bar contains links for 'Home', 'Login', 'Advanced Search', 'Browse', 'Contribute', and 'Collections'. The main content area is titled 'Resource Details' and shows a search result for 'Central Force Motion: Equations of Motion, Intro to Planetary Motion'. A yellow bar indicates '3 of 543 found resources' with 'Previous' and 'Next' navigation options. A '<XML>' link is present in the top right of the resource details section. The resource details are presented in two columns of tables. The left table lists basic metadata such as GUID, Title, Author(s), Download URL, Size, Description, Mediatype, Keywords, Taxonomy Path, and Learning Resource. The right table lists more detailed metadata including Interactivity, Difficulty, End User Role, Structure, Cost, Copyright, Datatype, Tech Requirements, Other Platform Requirements, isPartOf (with two links), and Submission Date.

**Central Force Motion: Equations of Motion, Intro to Planetary Motion** <XML>

<b>GUID</b>	iLumina:1354
<b>Title</b>	Central Force Motion: Equations of Motion
<b>Author(s)</b>	Wolfgang Christian Mario Belloni
<b>Download</b>	<a href="http://dl.uncwil.edu/physics/x_...">http://dl.uncwil.edu/physics/x_...</a>
<b>Size</b>	5.432 Kbytes
<b>Description</b>	This page discusses motion as well as masses, and the period of an orbit.
<b>Mediatype</b>	Java Applet
<b>Keywords</b>	sun, elliptical, binary star system
<b>Taxonomy Path</b>	Physics/Astronomy/Celestial Mechanics
<b>Learning Resource</b>	Exercise

<b>Interactivity</b>	High
<b>Difficulty</b>	Medium
<b>End User Role</b>	Learner
<b>Structure</b>	Individual Learning Resource
<b>Cost</b>	No
<b>Copyright</b>	Physlets, that is, the applets themselves, may be used to author new problems and these problems along with the Physlet jar files for non-profit, educational purposes without requesting permission.
<b>Datatype</b>	.class(application/x-java-class) .htm(text/html)
<b>Tech Requirements</b>	
<b>Other Platform Requirements</b>	
<b>isPartOf</b>	<b>1337:</b> <a href="http://dl.uncwil.edu/physics/x_physlets_01/physletprob/usafa/usafa.htm">http://dl.uncwil.edu/physics/x_physlets_01/physletprob/usafa/usafa.htm</a> <b>1137:</b> <a href="http://dl.uncwil.edu/physics/x_physlets_01/physletprob/resources.htm">http://dl.uncwil.edu/physics/x_physlets_01/physletprob/resources.htm</a>
<b>Submission Date</b>	6/4/2002

# Strengths of Digital Libraries as Educational & Research Knowledge Sources

- **Everything will be digital**
  - Due to the economics of digital copying, and mature conversion technology
- **Many innovative multimedia learning objects are broadly available**
  - Federated search portals make many distributed materials accessible
- **Finding resources is relatively easy**
  - Metadata helps make materials easy to find, understand, and reuse
- **Stability and preservation is improving**
  - E.g., NSDL's persistent archive (*UCSD Supercomputer Center*) maintains multiple copies of resources, and crawls collection links to 7 levels
- **Digital-rights management is also getting better**
  - E.g., NSDL uses *Shibboleth* to authenticate and authorize access to collections, as necessary

# Weaknesses of Digital Libraries as Educational & Research Knowledge Sources

- **Quality control is variable, often poor**
  - Reflecting “grass-roots” nature of collections, limited review, and loose acquisition policies
- **Digital finding, question-answering services are mediocre**
  - *Amazon* and *Google*, are good, but not always for novices or tough reference problems
- **Some DLs are sets of materials, not curated collections**
  - DLs often lack a (non-technical) purpose or mission
- **Many DLs are raw materials, not interpretations or modules**
  - Reuse of learning objects still remains a long-term goal
- **Many DLs are not strongly connected to the academic community, in research or the classroom**
  - Reflects funding: more for technology, some for content, little for usage, training or evaluation

# A Conclusion and Qualifications

*“Current digital libraries are 80% collections and 20% services. To make them rival a full academic library, they’ll need to offer many value-added filtering and collection-management services—and ones that reflect the needs of the academic community.”*

-- Dave McArthur, May 2003

But:

- Even if academic libraries persist, they will have to reckon with “everything will be digital”
- More and more services will be captured and automated over time

# A Different Perspective and a Conjecture

Don't focus on whether digital libraries will rival academic libraries but instead consider the dual thesis that:

- Future libraries will be *hybrids* of both, and...
- ...they will provide innovative new services, not just deliver existing ones more effectively.

# Fading of Place and Connections to Community

*“The library will be ubiquitous, and its range of services will dramatically overpower the roles related to the traditional library as “place” with its books and printed materials.”*

-- James W. Marcum. *Visions: The Academic Library in 2012*  
[www.dlib.org/ar/dlib/may03/marcum/05marcum.html](http://www.dlib.org/ar/dlib/may03/marcum/05marcum.html)

- Connections of digital resources directly into CMSs and online courses
  - Virtual collections in iLumina were designed for this purpose; a new NSF project based on this is exploring embedding such sets to WebCT courses
- Personalized library portals for faculty, instructors and students
  - Even real-time integration is possible as new tagged resources “announce themselves” when acquired (Cliff Lynch & Marvin Minsky)

# Institutional Repositories

- Institutional repositories as university knowledge management:

*“...a mature and fully realized institutional repository will contain the intellectual works of faculty and students—both research and teaching materials—and also documentation of the activities of the institution itself in the form of records of events and performance and of the ongoing intellectual life of the institution. It will also house experimental and observational data captured by members of the institution that support their scholarly activities.”*

-- Cliff Lynch, *ARL Bimonthly Report 226*, February 2003

- Who will play important roles in institutional repositories?

*“...an effective institutional repository of necessity represents a collaboration among librarians, information technologists, archives and records managers, faculty, and university administrators and policymakers”*

-- Cliff Lynch, *ARL Bimonthly Report 226*, February 2003

# Digital Libraries Sustained in Academic Libraries

“This project requests funding ... to integrate the iLumina digital library with UNCW’s Randall Library. In this way, the resources and expertise of a modern university research library can be utilized to provide a sustainable environment for iLumina that will facilitate increased access to its resources and those of the NSDL as a whole. By the end of the project, iLumina will become an integrated Randall Library repository, fully supported by the library’s budget.

In terms of broader impact, this project will provide a valuable model for sustainability by investigating the issues involved when integrating an existing NSDL repository with a traditional research library. The iLumina-Randall model will be shared with the *NSDL Sustainability Standing Committee* where it will be generalized and shared with the larger digital library community as a possible sustainability model for other NSF-funded digital libraries that are affiliated with universities.”

-- Proposal to the NSF *National Science, Technology, Engineering, and Mathematics Education Digital Library – NSDL*, April 2003.

- *Coming full circle*: At the beginning, the question was whether digital libraries would consume academic libraries. This suggests that academic libraries could consume digital libraries – in part to keep them alive.

# For Future Conversations

Far from threatening the livelihood of libraries and librarians, hybrid libraries may greatly change their functions and expand their scope of work...

- *What are the implications of this for librarians and their education?*