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# FEDORA Digital Repository Implementation at UVa

## or, You've All Heard About Fedora, Here's What We're Doing with It

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**DLF Spring Forum**

**May 15, 2003**

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# Background

In 1999, The UVa Library' s Digital Library Research and Development (DLR&D) group read an article in D-Lib about the Fedora (Flexible and Extensible Digital Object and Repository Architecture) system, designed by Carl Lagoze and Sandra Payette of the Cornell Digital Library Research Group.

By the summer of 2001 UVa built an “alpha” testbed that included 500,000 data objects and a variety of disseminators for electronic finding aids, TEI-encoded etexts of letters and books, and for XML-encoded structured collections of art, architecture and archeology images, and a set of social science data.

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# Background

In late 2001, The UVa Library Digital Library Research and Development Group began collaboration with the Cornell Digital Library Research Group to develop Fedora under a $1,000,000 Andrew W. Mellon Foundation grant. A number of deployment partners signed on to test deploy the system during its development.

On May 16, 2003, release 1.0 of the Fedora digital object repository management system was made available under a Mozilla Public License through the project web site. The UVa Library is also launching its first phase production repository within the UVa domain.

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# Fedora Architecture

- Fedora is written in Java 1.4.
- A Fedora repository is exposed as a Web service and is described using Web Services Description Language (WSDL).
- Digital object behaviors are implemented as linkages to distributed web services that are expressed using WSDL and implemented via HTTP GET/POST or SOAP bindings.
- Digital objects are encoded and stored as XML using the Metadata Encoding and Transmission Standard (METS).

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# Fedora Architecture

- The Fedora architecture is based on object models that represent data objects (units of content) or collections of data objects.
- The objects contain linkages between datastreams (internally managed or external), metadata (inline or external), and behaviors that are themselves code objects and link to disseminators (processes, mechanisms, and external software.
- Object models can be thought of as containers that give a useful shape to information poured into them; if the information fits the container, it can immediately be used in predefined ways.

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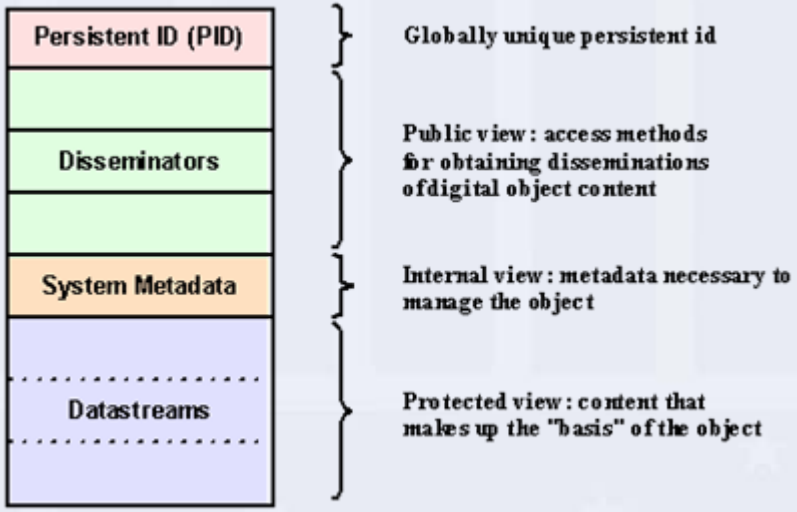
# Object Models

- A Fedora object has four basic components:
  - A persistent identifier or PID. Handles are not currently used.
  - A set of disseminators that define a set of behaviors the object can perform.
  - A set of descriptive and administrative metadata about the object and its content.
  - One or more datastreams that define the content of the object.
- Objects “subscribe” to the same object model if they share the same basic object structure by having the same number and type of datastreams (content streams) and by having the same set of disseminators or behaviors.



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# Design of Models and Disseminators

- Fedora developers met with image and text content and format specialists, application developers, and user service librarians to understand what media files we have and how our users expect to find them and use them.
- Specifications were set for:
  - Datastreams (formats, variation in deliverables [EAD vs. TEI vs. Ebooks, page images vs. documentary images])
  - Metadata
  - Discovery (metadata vs. full-text searching, presentation of results sets, etc.)
  - Delivery (must support static and on-the-fly file delivery, and varied end user download and printing requirements)

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# Image Object Model

- The General UVa Image Object Model design includes four separate datastreams (or basis):
  - Preview- sized images
  - Screen-sized images
  - A MrSID version
  - The “Delivery Master” (the image that was used to derive the other datastreams)
- The disseminators that define the functionality of the object by describing a set of behaviors or Behavior Definitions. The uvaImage disseminator consists of five behaviors
  - getPreview – retrieve the preview size of the image
  - getScreen – retrieve the screen size of the image
  - getImageViewer – retrieve the screen size of the image but with additional image manipulation tools
  - getSizedImage(x,y) – retrieve the specified size of the image
  - getDeliveryMaster – retrieve the delivery master (or ascertain its off-line location)

# Persistent ID (PID)

## Disseminators

| Disseminator | Behavior Definition | Behavior Mechanism |
|---|---|---|
| uvaImage | genImageBdef | genImageBmech |
| | getPreview | HTTP GET |
| | getScreen | HTTP GET |
| | getImageViewer | TBD |
| | getSizedImage(x,y) | get_mrsid_url.pl |
| | getDeliveryMaster | TBD |
| uvaMetadata | uvaMetaBdef | TBD |
| | getDescriptive | TBD |
| | getTechnical(ds) | TBD |
| | getDigiprov(ds) | TBD |
| | getRights(ds) | TBD |
| | getSource(ds) | TBD |

## System Metadata

| | |
|---|---|
| uvalibadmin | Administrative metadata |
| uvalibdesc | Descriptive metadata |

## Basis

| Datastream(s) | |
|---|---|
| DS1 | pointer to thumbnail size image |
| DS2 | pointer to screen size resolution image |
| DS3 | pointer to MrSID image |
| DS4 | TBD |

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# Text Object Model

- All electronic texts in the Central Repository will be encoded as TEI in XML. Each digital object will also contain descriptive and administrative metadata about the object as a whole and about each of its datastreams. The uvaMetadata disseminator will be available on every object and will provide the capability to retrieve descriptive and administrative about the object and its content. The UVa General Text Object Model contains five datastreams:
  - Static XML version of text – points to the raw XML version of the text.
  - Static XHTML version of text – points to an XHTML version of the text or to a placeholder indicating that a static version does not exist and will be dynamically generated.
  - Static PDF version of text – points to PDF version of the text or to a placeholder indicating that a static PDF version does not exist and will be dynamically generated.
  - Static PDB version of text – points to PDB version of the text or to a placeholder indicating that a static PDB version does not exist and will be dynamically generated.
  - Static LIB version of text – points to LIB version of the text or to a placeholder indicating that a static version does not exist and emails a request to have one externally generated.

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# Text Object Model, continued

- It is desirable to have a single behavior definition for all electronic text, but with multiple implementations (behavior mechanisms) for each different type, sharing the same behavior definition. The General Text Behavior Definition defines eight basic behaviors for all electronic texts:
  - getPreview – display a “preview” representation of the text that represents a bibliographic citation.
  - getTreeView(level) – display an XML DOM node tree representation of the text down to the specified level in the text.
  - getChunk(idref) – get a chunk of XML specified by the idref; this behavior retrieves the specified XML fragment from the text.
  - getChunks(XPath) – get multiple chunks of XML specified by the XPath expression; this behavior may retrieve multiple XML fragments from the text.
  - getStaticView – display static HTML view of text; the static view would be a view just of the text itself.
  - getDynamicView – display the text in an interactive HTML form; the dynamic view would include the full set of support tools available for the particular type of text.
    - getPrintable(format) – download a version of the file in the specified format; at present, three formats would be allowed including .pdf, .pdb, and .lib.
    - getDeliveryMaster – download raw XML text of delivery master

# Persistent ID (PID)

## Disseminators

| Disseminator | Behavior Definition | Behavior Mechanism |
|---|---|---|
| uvaText | uvaTextBdef | uvaTextBmech |
| | getPreview | TBD |
| | getTreeView(level) | TBD |
| | getChunk(idref) | TBD |
| | getChunks(XPath) | TBD |
| | getStaticView | TBD |
| | getDynamicView | TBD |
| | getPrintable(format) | TBD |
| | getDeliveryMaster | HTTP GET/FTP |
| uvaMetadata | uvaMetadataBdef | uvaMetadataBmech |
| | getDesc(ID) | TBD |
| | getTech(ID) | TBD |
| | getDigiprov(ID) | TBD |
| | getSource(ID) | TBD |
| | getRights(ID) | TBD |

## System Metadata

| | |
|---|---|
| uvalib:admin | Administrative metadata |
| uvalib:desc | Descriptive metadata |

## Datastreams

| Datastream(s) | |
|---|---|
| DS1 | pointer to XML text |
| DS2 | pointer to static XHTML version of text |
| DS3 | pointer to PDF version of text/placeholder |
| DS4 | pointer to PDB version of text/placeholder |
| DS5 | pointer to LIB version of text/placeholder |

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# Effect on Production

- Development of new file naming conventions across the Library.
- Documentation of deliverable file formats and sizes.

  http://iris.lib.virginia.edu/dl/reports/best_practices.html
- Development of UVa Metadata, documentation of minimum metadata standards, and mappings to TEI, EAD, VRA Core, and Dublin Core.
- Development and introduction of the General Descriptive Modeling Scheme (GDMS) and a GDMS Tool to create structured representations of collections of objects.
- Development of a workflow and tools for batch processing of deliverable files and loading into repository directory trees.
- Development of batch tools to create Fedora objects, creating the linkages between media files, metadata, and disseminators.

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# Discovery

- Indexing and searching are handled outside of Fedora.
- The current UVa implementation uses Tamino and OpenText. OpenText will be updated to XPAT, and Tamino has proved to be a poor fit for use with full-text, so other products (such as Ipedo) are under review.
- The web-based discovery interface uses external indexes to build a results set; the interface uses XSLT to format results, in combination with JavaScripts that build menus on-the-fly to display metadata and available functions.

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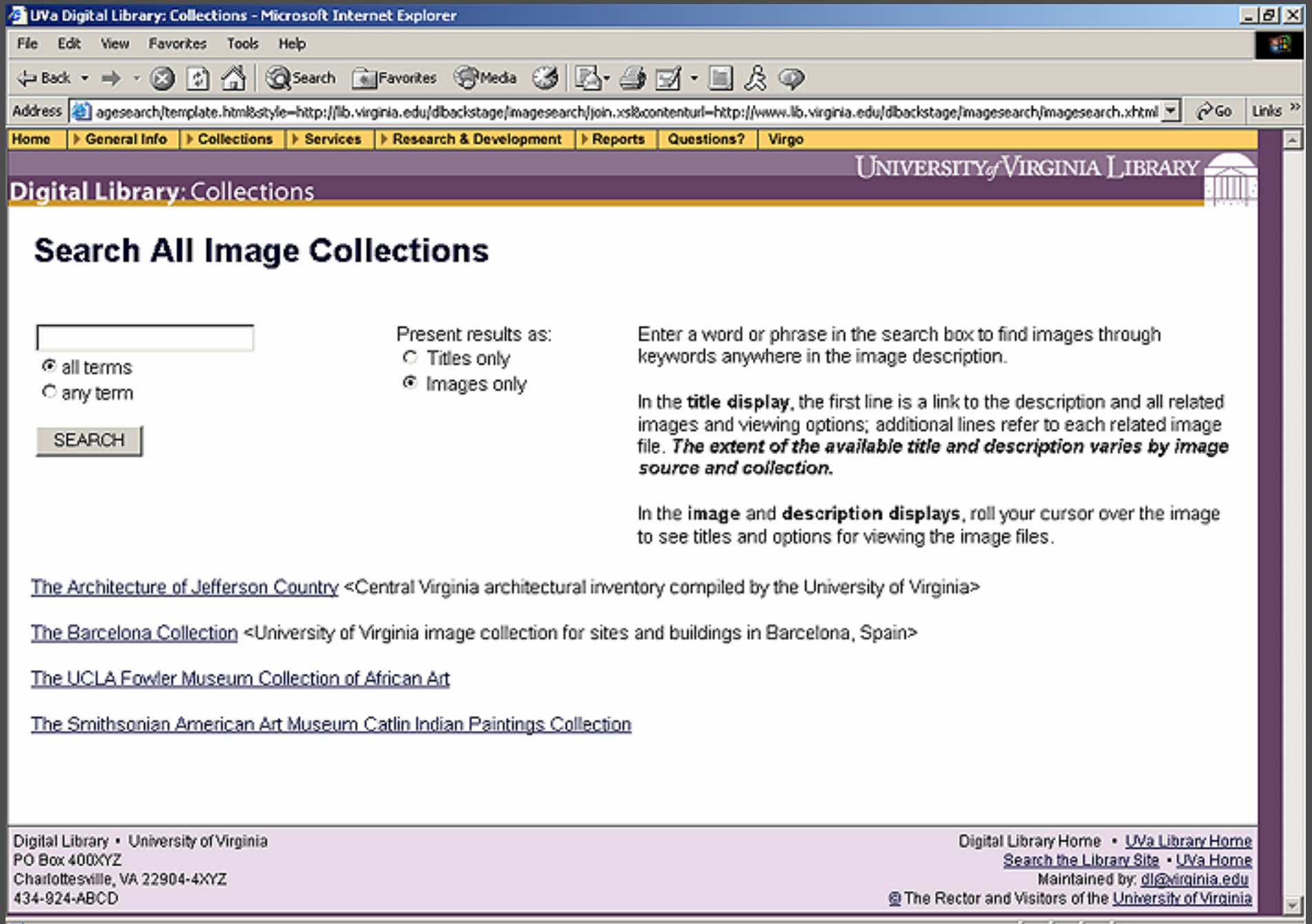
# Delivery

- When objects are selected for viewing or downloading, calls are sent to Fedora via URL parameters to retrieve the objects, which are formatted using XSLT.
- The majority of the current Fedora disseminators use a combination of Perl programs and XSLT to format the objects for display.
- Other disseminators include wrapping a zooming and panning Java applet around an image;  generating a downloadable JPEG from the MrSID file; and delivering downloadable versions of XML EAD files for partnering institutions.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In the image and description displays, roll your cursor over the image to see titles and options for viewing the image files.
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The Smithsonian American Art Museum Catlin Indian Paintings Collection
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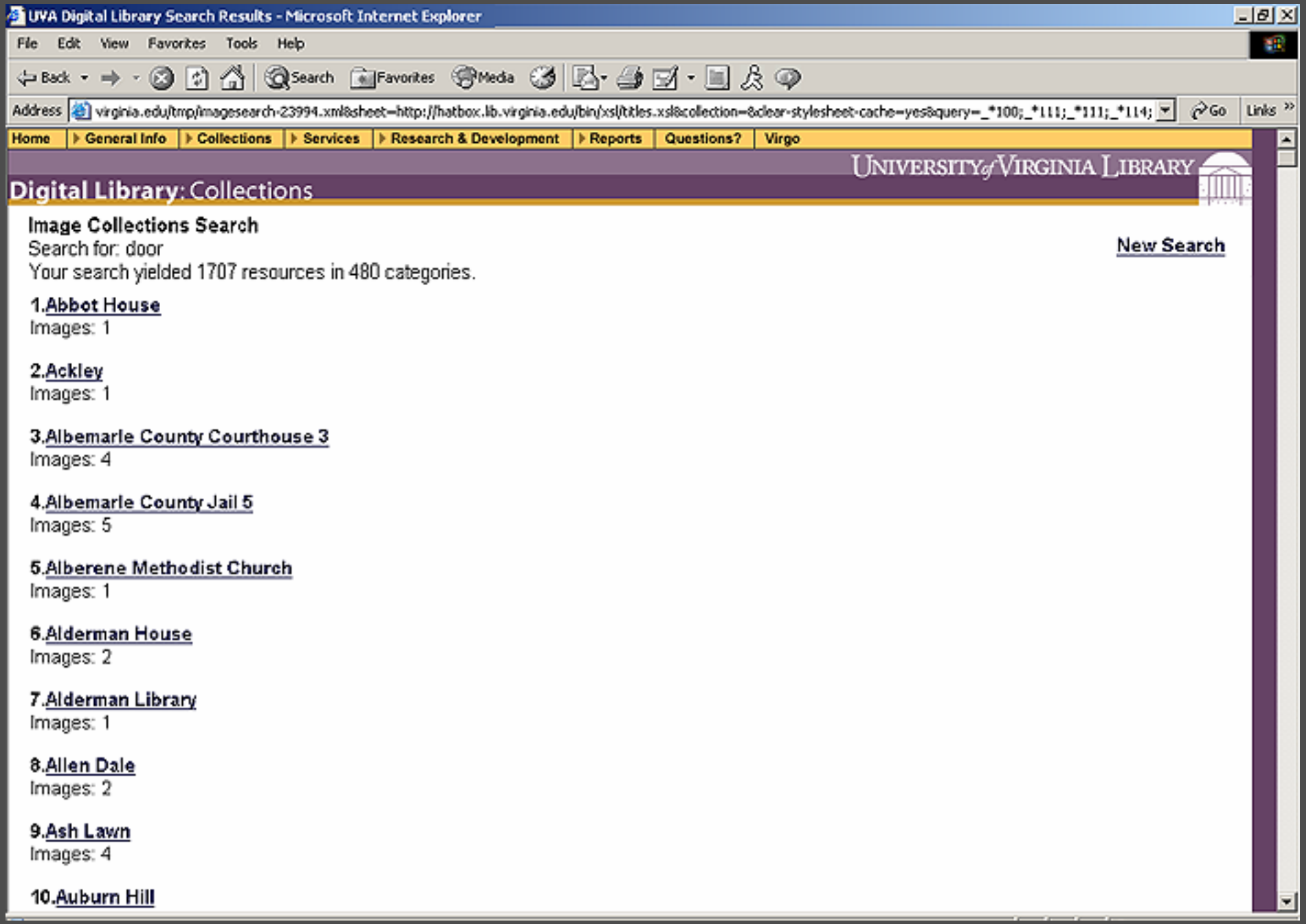
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Digital Library: Collections
Image Collections Search
Search for: door
Your search yielded 1707 resources in 480 categories.
New Search
1.Abbot House
Images: 1
2.Ackley
Images: 1
3.Albemarle County Courthouse 3
Images: 4
4.Albemarle County Jail 5
Images: 5
5.Alberene Methodist Church
Images: 1
6.Alderman House
Images: 2
7.Alderman Library
Images: 1
8.Allen Dale
Images: 2
9.Ash Lawn
Images: 4
10.Auburn Hill

UVA Digital Library Search Results - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites Media

Address ginia.edu/tmp/imagesearch-23978.xml&sheet=http://hatbox.lib.virginia.edu/bin/xsl/thumbs.xsl&collection=&clear-stylesheet-cache=yes&query=_*100;_*111;_*111;_*114; Go Links

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**Digital Library**: Collections

**Image Collections Search -- Thumbnail View**

New Search

Search for: door

1 - 20 of 1707 images

Jump to: 1 427 854 1280 1707

UVA Digital Library Search Results - Microsoft Internet Explorer

File Edit View Favorites Tools Help

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Address ginia.edu/tmp/imagesearch-24001.xml&sheet=http://hatbox.lib.virginia.edu/bin/xsl/thumbs.xsl&collection=&clear-stylesheet-cache=yes&query=_*100;_*111;_*111;_*114; Go Links

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**Digital Library**: Collections

**Image Collections Search -- Thumbnail View**

New Search

Search for: door

1 - 20 of 1707 images

Jump to: 1 427 854 1280 1707

**Ten-squát-a-way, The Open Door, Known as The Prophet, Brother of Tecumseh**
**artist:** George Catlin
**owner:** Smithsonian American Art Museum
**subject:** portrait
**medium:** oil
**extent:** 29 x 24 in.
**credit:** Smithsonian American Art Museum, Gift of Mrs. Joseph Harrison, Jr.
**tribe:** Shawnee
**creation:** 1830
**identifier:** 1985.66.279

## Related Texts

*William H. Truettner, The Natural Man Observed: A Study of Catlin's Indian Gallery (Washington, D.C.: The Smithsonian Institution Press in cooperation with the Amon Carter Museum and The National Collection of Fine Arts, 1979).*

"The 'Shawnee Prophet,'; is perhaps one of the most remarkable men, who has flourished on these frontiers for some time past. This man is brother of the famous Tecumseh, and quite equal in his medicines or mysteries, to what his brother was in arms; he was blind in his left eye, and in his right hand he was holding his 'medicine fire,'; and his 'sacred string of beads'; in the other. With these mysteries he made his way through most of the North Western tribes, enlisting warriors wherever he went, to assist Tecumseh in effecting his great scheme, of forming a confederacy of all the Indians on the frontier, to drive back the whites and defend the Indians' rights; which he told them could never in any other

About | Info | 100% | Fit to Frame | +25% | 50% | -25%

## Chair and **Cloud**

**alternate title:** Editorial Montaner y Simón.
**alternate title:** Fundació Antoni Tàpies.
**creator:** Tàpies, Antoni,
**contributor:** Domènech i Montaner, Lluís,
**subject:** Office buildings. , Modernist. , Public art , Outdoor sculpture , Sculpture
**notes:** Building originally a publishing house for Montaner y Simón; designed by Lluís Domènech i Montaner, 1879.
**identifier:** S-20-Tap-3.4
**location:** Barcelona, Spain ;C/Arago, 255, Eixample.41.4172.167
**creation:** 1990
**medium:** Steel and aluminum mesh.


Oblique view of building


Front view with rooftop artwork


Detail of wire


View of sculpture


Detail, three bays of building.

# A Guide to the Angelica Schuyler Church Papers

Accession number 11245

A Collection in the

Special Collections Department

Contact Information:
University of Virginia Library
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Charlottesville, Virginia 22903
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# A Guide to the Angelica Schuyler Church Papers
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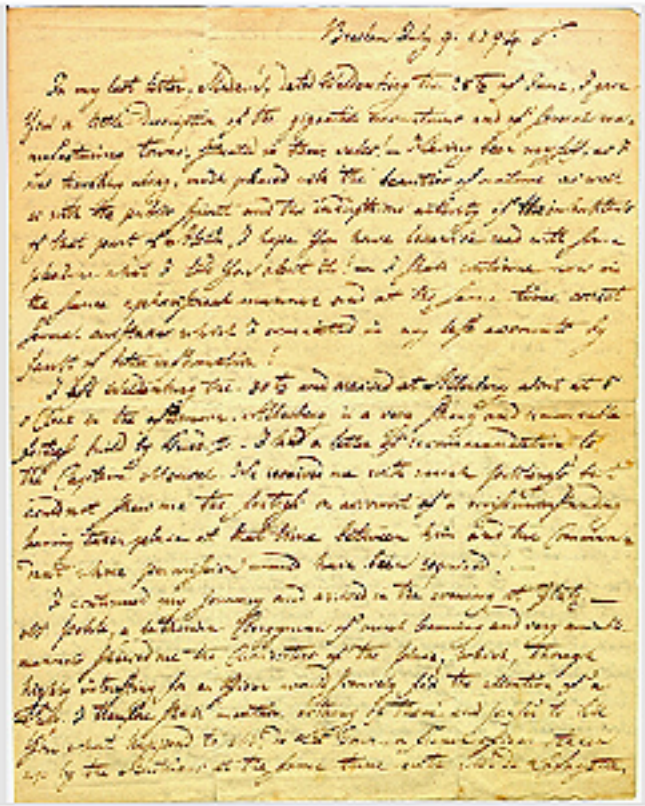

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Lewis, Meriwether []
Original Journals of the Lewis and Clark Expedition, 1804-1806
Vol. 1

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**Lewis, Meriwether []**
**Original Journals of the Lewis and Clark Expedition, 1804-1806**
**Vol. 1**

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[Clark:]

*25th. Sept. —*

A FAIR Morning the Wind from the S. E. all well, raised a Flag Staff & made a orning or Shade on a Sand bar in the mouth of Teton River, for the purpose of Speeking with the Indians under, the Boat Crew on board at 70 yards Distance from the bar The 5 Indians which we met last night Continued, about 11 OClock the 1t. & 2d. Chief Came we gave them Some of our Provisions to eat, they gave us great Quantitis of Meet Some of which was Spoiled we feel much at a loss for the want of an interpeter the one we have can Speek but little.

Met in Council at 12 oClock and after Smokeing, agreeable to the useal Custom, Cap. Lewis proceeded to Deliver a Speech which we [were — Ed.] oblige[d] to Curtail for want of a good interpeter all our party paraded, gave a Medal to the Grand Chief Calld. in Indian *Un ton gar Sar bar* in French *Beelfe nuve* [Beuffle noir] Black Buffalow. Said to be a good Man, 2[nd] Chief *Tovto hon gar* or the *Parti sin* or Partizan *bad* the 3rd. is the Beffe De Medison [Beuffe de Medecine] his name is *Tar ton gar Wa ker* 1[st]. Considerable Man, *War zing go.* 2[nd]. Considerable Man *Second Bear — Mato co que par.*

*Perogues with 5 men — 3 & 2 Ind.*) (which left the boat with great reluctiance) to Shore with a view of reconsileing those men to us, as Soon as I landed the Perogue three of their young Men Seased the Cable of the Perogue, (*in which we had pressents &c*) the Chiefs Sold.r [*each Chief has a soldier*] Huged the mast, and the 2.d Chief was verry insolent both in words & justures (*pretended Drunkenness & staggered up against me*) declareing I should not go on, Stateing he had not receved presents sufficent from us, his justures were of Such a personal nature I felt My self Compeled to Draw my Sword (*and*

Catlin, George [1796-1872]

**Die Indianer Nord-Amerikas und die während eines achtjährigen Aufenthalts unter den wildesten ihrer Stämme erlebten Abenteuer und Schicksale**

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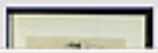
**Images 1 through 10**

Start of book | Previous 10 images | Next 10 images | End of book



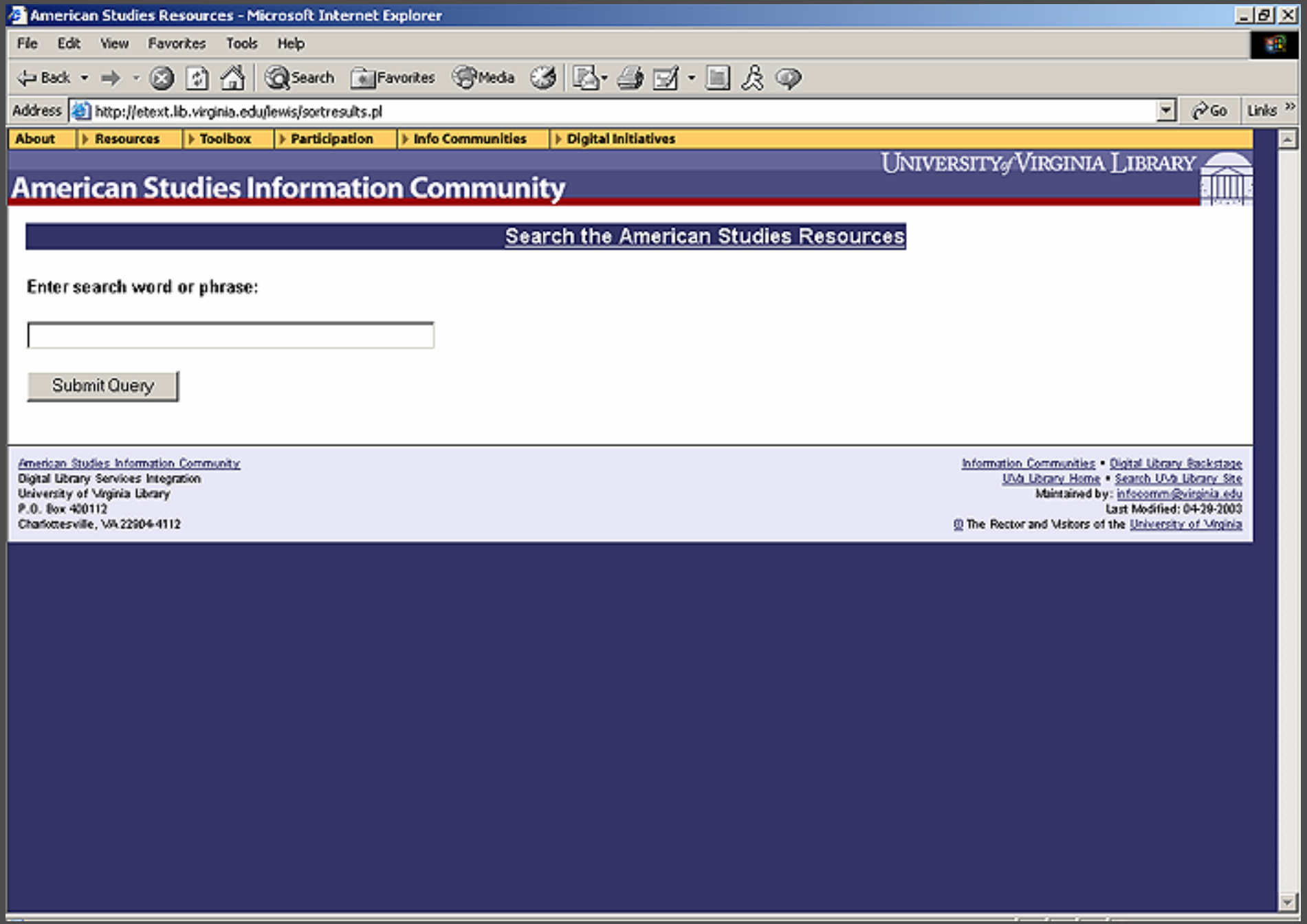


Catlin, George [1796-1872]

**Die Indianer Nord-Amerikas und die während eines achtjährigen Aufenthalts unter den wildesten ihrer Stämme erlebten Abenteuer und Schicksale**

Image 004 of Go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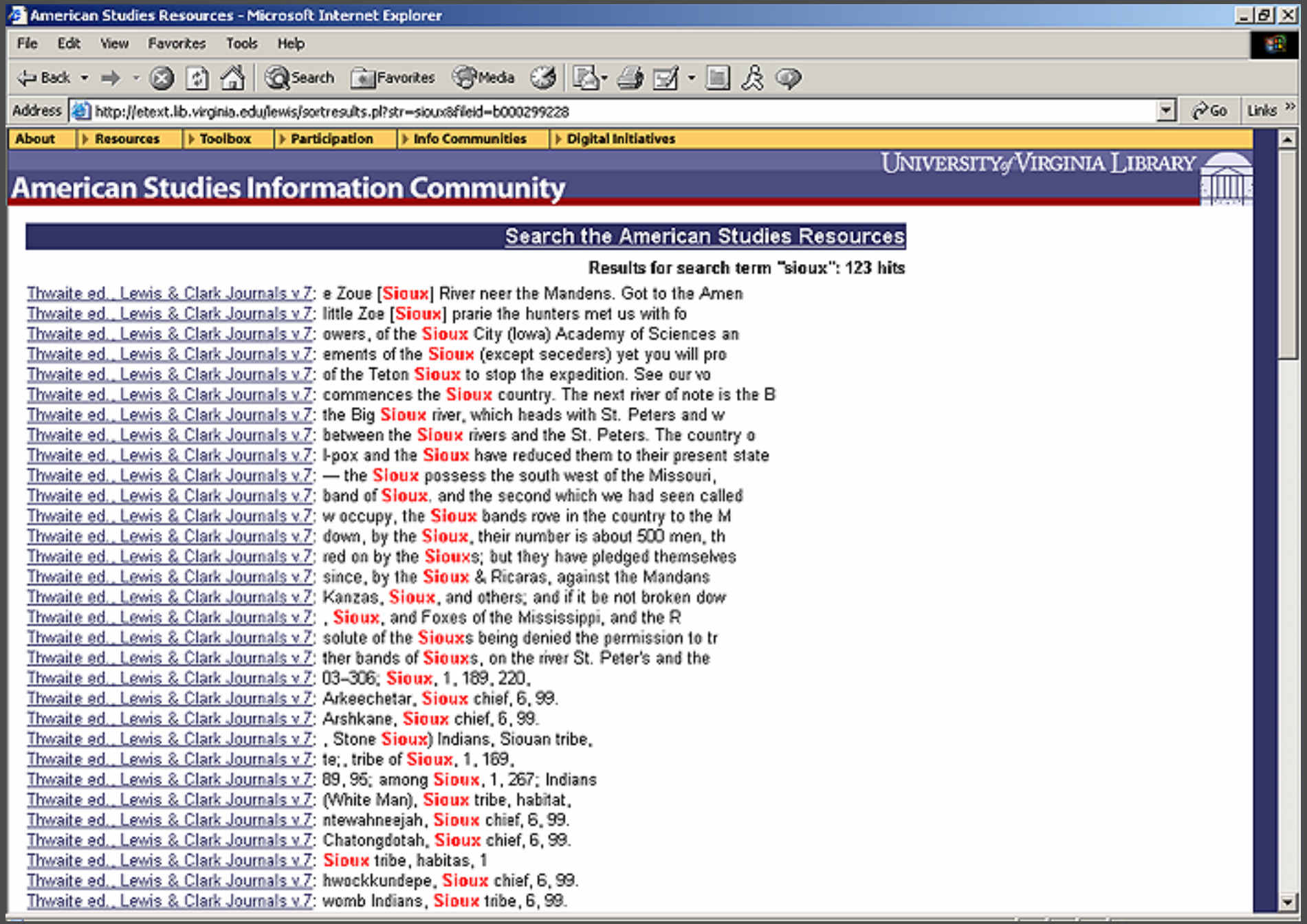
## Search the American Studies Resources

**540 text matches for "sioux"**

Thwaite ed., Lewis & Clark Journals v.7: *123 matches*
z000000010: *118 matches*
The Prairie, Volume 2.: *112 matches*
Thwaite ed., Lewis & Clark Journals v.6: *72 matches*
z000000011: *42 matches*
Thwaite ed., Lewis & Clark Journals v.1: *29 matches*
The Prairie, Volume 1: *29 matches*
Thwaite ed., Lewis & Clark Journals v.5: *9 matches*
Thwaite ed., Lewis & Clark Journals v.3: *3 matches*
Thwaite ed., Lewis & Clark Journals v.2: *3 matches*

**120 image matches for "sioux"**

War Dance, Sioux: *6 matches*
Sioux Dog Feast: *6 matches*
War Dance, Sioux: *5 matches*
Battle between Sioux and Sac and Fox: *5 matches*
Self-torture in a Sioux Religious Ceremony: *4 matches*
Band of Sioux Moving Camp: *4 matches*
Sioux Encamped on the Upper Missouri, Dressing Buffalo Meat and Robes: *4 matches*
Sioux Indians on Snowshoes Lancing Buffalo: *4 matches*
Medicine Buffalo of the Sioux: *4 matches*
Sioux Indian council, Chiefs in Profound Deliberation: *4 matches*
An-nó-je-nahge, He Who Stands on Both Sides, a Distinguished Ball Player: *4 matches*
Ha-wón-je-tah, One Horn, Head Chief of the Miniconjou Tribe.: *4 matches*
: *4 matches*
Sioux Worshiping at the Red Boulders: *4 matches*
View on the St. Peter's River, Sioux Indians Pursuing a Stag in their Canoes: *3 matches*
Fort Pierre, Mouth of the Teton River, 1200 Miles Above St. Louis: *3 matches*
Butte de Mort, Sioux burial ground, Upper Missouri: *3 matches*
Scalp Dance, Sioux: *3 matches*
Sioux Village, Lake Calhoun, Near Fort Snelling: *3 matches*
Bear Dance, Preparing for a Bear Hunt: *3 matches*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Results for search term "sioux": 123 hits
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Thwaite ed., Lewis & Clark Journals v 7: owers, of the Sioux City (Iowa) Academy of Sciences an
Thwaite ed., Lewis & Clark Journals v 7: ements of the Sioux (except seceders) yet you will pro
Thwaite ed., Lewis & Clark Journals v 7: of the Teton Sioux to stop the expedition. See our vo
Thwaite ed., Lewis & Clark Journals v 7: commences the Sioux country. The next river of note is the B
Thwaite ed., Lewis & Clark Journals v 7: the Big Sioux river, which heads with St. Peters and w
Thwaite ed., Lewis & Clark Journals v 7: between the Sioux rivers and the St. Peters. The country o
Thwaite ed., Lewis & Clark Journals v 7: l-pox and the Sioux have reduced them to their present state
Thwaite ed., Lewis & Clark Journals v 7: — the Sioux possess the south west of the Missouri,
Thwaite ed., Lewis & Clark Journals v 7: band of Sioux. and the second which we had seen called
Thwaite ed., Lewis & Clark Journals v 7: w occupy, the Sioux bands rove in the country to the M
Thwaite ed., Lewis & Clark Journals v 7: down, by the Sioux, their number is about 500 men, th
Thwaite ed., Lewis & Clark Journals v 7: red on by the Sioux; but they have pledged themselves
Thwaite ed., Lewis & Clark Journals v 7: since, by the Sioux & Ricaras, against the Mandans
Thwaite ed., Lewis & Clark Journals v 7: Kanzas, Sioux, and others; and if it be not broken dow
Thwaite ed., Lewis & Clark Journals v 7: , Sioux, and Foxes of the Mississippi, and the R
Thwaite ed., Lewis & Clark Journals v 7: solute of the Sioux being denied the permission to tr
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Thwaite ed., Lewis & Clark Journals v 7: Arshkane, Sioux chief, 6, 99.
Thwaite ed., Lewis & Clark Journals v 7: , Stone Sioux) Indians, Siouan tribe,
Thwaite ed., Lewis & Clark Journals v 7: te;, tribe of Sioux, 1, 169,
Thwaite ed., Lewis & Clark Journals v 7: 89, 95; among Sioux, 1, 267; Indians
Thwaite ed., Lewis & Clark Journals v 7: (White Man), Sioux tribe, habitat,
Thwaite ed., Lewis & Clark Journals v 7: ntewahneejah, Sioux chief, 6, 99.
Thwaite ed., Lewis & Clark Journals v 7: Chatongdotah, Sioux chief, 6, 99.
Thwaite ed., Lewis & Clark Journals v 7: Sioux tribe, habitas, 1
Thwaite ed., Lewis & Clark Journals v 7: hwockkundepe, Sioux chief, 6, 99.
Thwaite ed., Lewis & Clark Journals v 7: womb Indians, Sioux tribe, 6, 99.

Lewis, Meriwether [1774-1809]
Original Journals of the Lewis and Clark Expedition (v.7)

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commences the **Sioux** country. The next river of note is the Big **Sioux** river, which heads with St. Peters and waters of lake Winnepic, in some high wooded country. About 90 miles higher up, the river Jaque falls on the same side, and about one hundred yards wide. This river heads with the waters of lake Winnepic, at no great distance east from this place. The head of the River Demon is in Pilican lake, between the **Sioux** rivers and the St. Peters. The country on both sides of the Missouri, from the river Plate to that place, has very much the same appearance: extensive fertile plains, with but very little timber, and that little principally confined to the river bottoms and streams. The country east of this place, and off from the Missouri as low as Stone river, contains a number of small lakes, many of which are said to be so much impregnated with glauber salts, as to produce all its effects; certain it is, that the water in the small streams from the hills below, on the south west side, possesses this quality. About the river Jacque, Bruffala county contains great quantities of mineral, cobalt, cinnebar, alum, copperas, and several other things; the stone coal which is on the Missouri is very indifferent. Ascending 52 miles above the Jacque, the river Quicum falls in on the south west side. This river is, 1026 miles up, 150 yards wide, not navigable; it heads in the black mountains, which run nearly parallel to the Missouri, from about the head of the Kanzas river, and end S. W. of this place. Quicum waters a broken country, 122 miles by water higher. White river falls in on the south west side, and is 300 yards wide, and navigable, as all the

## Stán-au-pat, Bloody Hand, Chief of the Tribe

**subject**: portrait
**medium**: oil
**extent**: 29 x 24 in.
**credit**: Smithsonian American Art Museum, Gift of Mrs. Joseph Harrison, Jr.
**artist**: George Catlin
**owner**: Smithsonian American Art Museum
**tribe**: Arikara
**tribe**: Sahnish
**creation**: 1832
**identifier**: 1985.66.123

### Related Texts

*William H. Truettner, The Natural Man Observed: A Study of Catlin's Indian Gallery (Washington, D.C.: The Smithsonian Institution Press in cooperation with the Amon Carter Museum and The National Collection of Fine Arts, 1979).*

Bloody Hand is described as having Â"his face painted with red vermilion, scalping-knife in his hand,Â" and Â"wearing a beautiful dressÂ" (1848 catalogue, p. 18).

Painted at the Arikara village in 1832. The broad modeling and strong features are typical of the Upper Missouri portraits. Bloody Hand also appears, full length, in cartoon 36, with his wife.

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# Digital Library

**The Digital Library** is a distributed and flexible technology infrastructure that enhances access, manipulation, storage, distribution, and integration of information and services throughout the University of Virginia.

The vision for the Digital Library initiatives come in part from the work of a series of committees that participated in the Library of Tomorrow (LoT) planning process in 2001, guiding a five-year program to transform the Library into the model university research library for the twenty-first century.

FEDORA

Digital Image Collections Search Demo

- Library of Tommorrow
- Information Communities
- Electronic Centers
- University of Virginia
- Give to the UVa Library

## Spotlight

The integrated image collection is UVA's first repository that contains images from Library collections, licensed resources, and faculty projects where the resources are available through a single search for use by the UVa community for teaching and research.

## Announcements

**Fedora Release:** The first version of the Fedora digital object repository management system will be released under a public license on May 16, 2003, through the project web site.

**Presentations:** Thorny Staples gave a presentation on the Fedora release at the CNI Task Force meeting on April 28; Leslie Johnston gives a presentation on services developed with Fedora and Chris Ruotolo gives a presentation on the Information Communites at the DLF Forum on May 15.

Digital Library
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# Future

- Further development of a heterogeneous Collection Object Model, with core behaviors that should be applicable across entire collections (getInventory, getPIDs, etc.)
- Migration of the image and text collections into Fedora, and transformation of the prototype delivery applications into Fedora disseminators.
- Development of object models and disseminators for data sets.
- Future authoring and delivery services will be developed on top of the repository for users:
  - An improved GDMS XML authoring tool that is usable by faculty.
  - Distributed repository storage in affiliated user's "home directories" elsewhere in the University environment.
  - A "shopping cart" for the repository that allows users to create and retain persistent sets.
  - Linkages between repository disseminators and commercial tools.