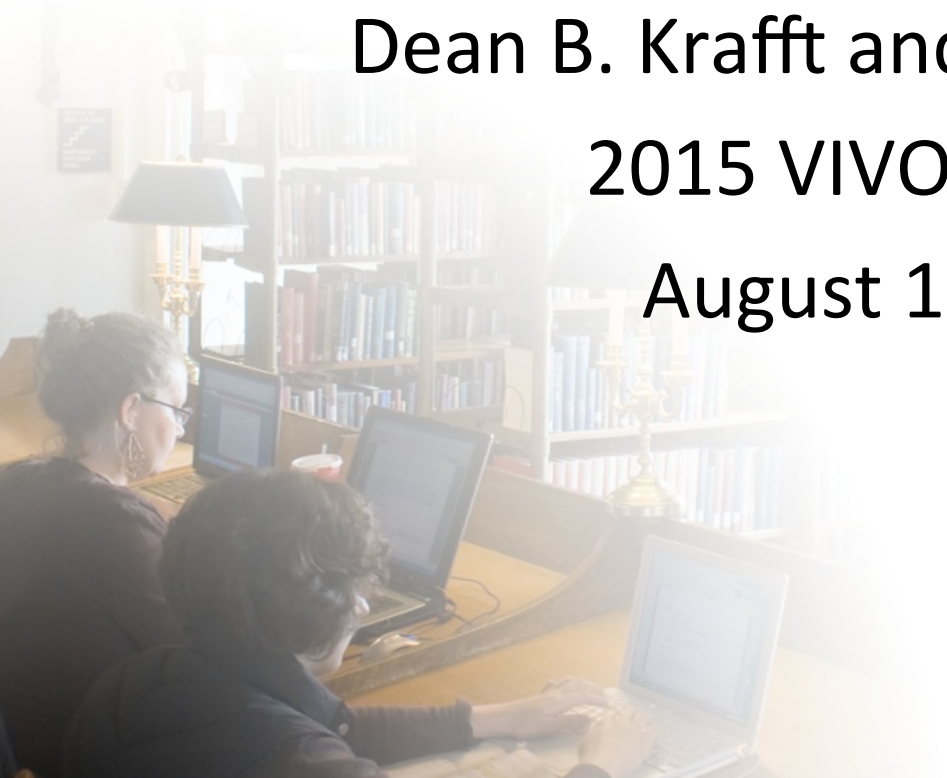
Linked Data for Libraries

Dean B. Krafft and Jon Corson-Rikert

2015 VIVO Conference

August 12-14, 2015



Cornell University Library

Linked Data for Libraries (LD4L)

- On December 5, 2013, the Andrew W. Mellon Foundation made a two-year $999K grant to Cornell, Harvard, and Stanford starting Jan ‘14
- Partners will work together to develop an ontology and linked data sources that provide relationships, metadata, and broad context for Scholarly Information Resources
- Leverages existing work by both the VIVO project and the Hydra Partnership

Vision: Create a LOD standard to exchange all that libraries know about their resources

Courtesy National Gallery of Art, Washington

Overview

Specific LD4L goals

- Free information from existing library system silos to provide context and enhance discovery of scholarly information resources
- Leverage usage information about resources
- Link bibliographic data about resources with academic profile systems and other external linked data sources
- Assemble (and where needed create) a flexible, extensible LD ontology to capture all this information about our library resources
- Demonstrate combining and reconciling the assembled LD across our three institutions

How LD4L builds on VIVO

- The LD4L ontology uses components of the VIVO-ISF ontology and some of its design patterns
- The Vitro software platform used for VIVO is being adapted to support LD4L ontology editing and sample content development, search, and browsing
- The multi-institution LD4L demonstration search will follow the approach used for VIVOsearch.org
- LD4L data will incorporate existing VIVO, Stanford CAP, and Harvard Faculty Finder URIs

Overall timeline

- 2014: Develop use cases; Assemble LD4L ontology; Plan use of BIBFRAME and connections to existing URI-based entities
- February 2015: LD4L Workshop
- Feb-Aug 2015: Pilot full catalog conversion pipeline; Engineering for use cases
- Aug 2015-Jan 2016: Make LD4L ontology-based full catalog LD available from 3 partners; demonstrate cross-site search and use case tools

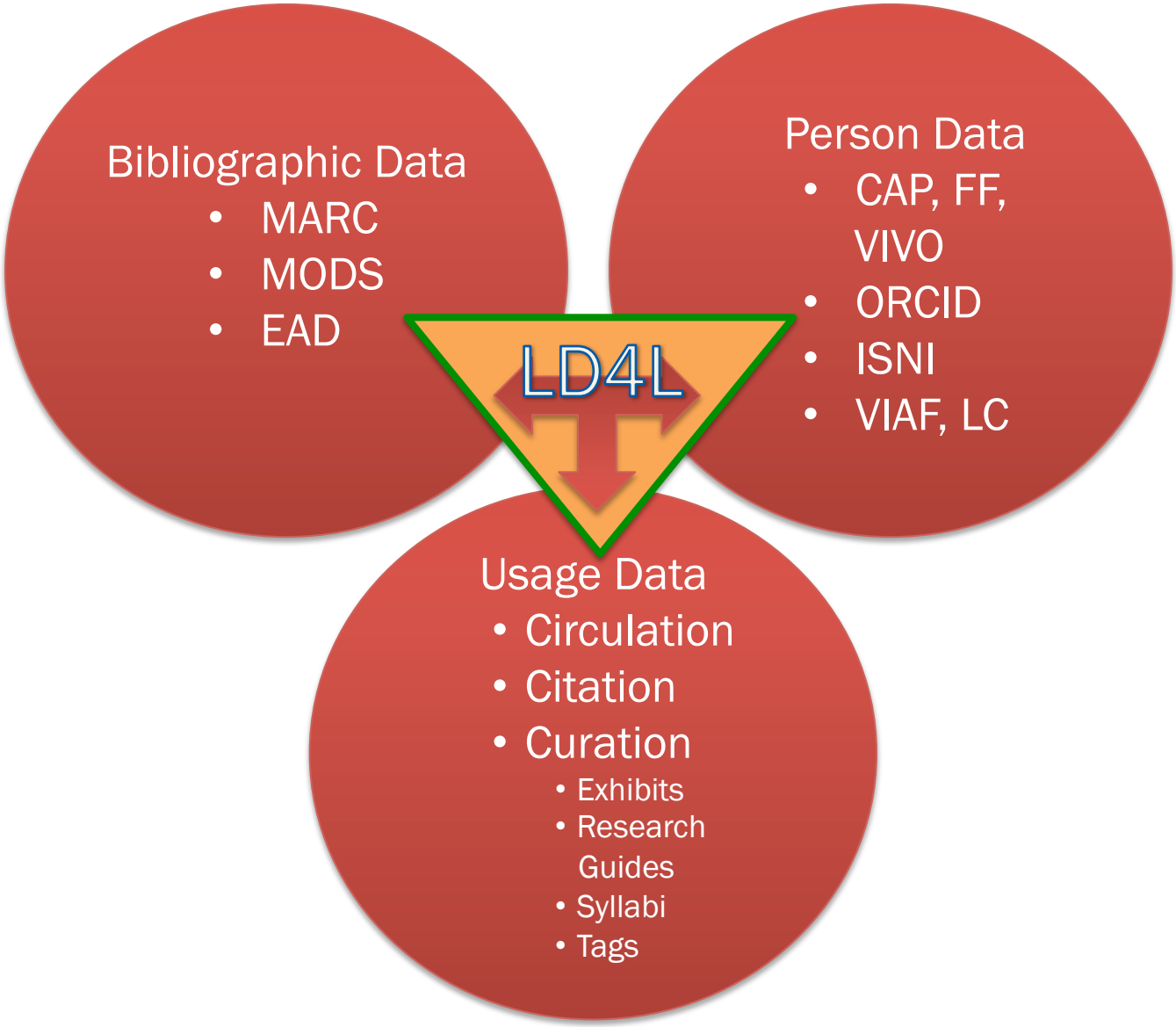
Workshop – February 2015

- Held a two-day workshop for 50 attendees from 10-12 interested library, archive, and cultural memory institutions
- Demonstrated initial prototypes of LD4L and ontology
- Obtained feedback on initial ontology choices
- Obtained feedback on overall design and approach
- Gained an understanding of how institutions see this approach fitting in with their own multi-institutional collaborations and existing larger efforts such as the Digital Public Library of America, VIVO, and BIBFRAME

LD4L working assumptions

- Trying to do conversion and relation work at scale--with full sets of enterprise data
  - Harvard: 13.6 million bibliographic records
  - Stanford and Cornell: roughly 8 million bib records in each collection
- Trying to understand the pipeline / workflows that will be needed for this
- Looking to build useful, value-added services on top of the assembled triples

LD4L data sources



Challenges

- At this stage, perfection as the enemy of the good (e.g., in ontologies and reconciliation)
- When to mint vs. reference existing URIs
- Wider issues of global entity reconciliation including drift, variable adoption
- Scale
- Needed workflows and services as part of local and global partnerships
- Leveraging technologies developed for other purposes (e.g., LibGuides, DMS, CAP)
- Thinking outside the bibliographic box

Advantages to VIVO projects

- Libraries are key partners in many if not most VIVO projects
- Broadening the scope of linked data work at an institution builds mindshare and may draw expertise and resources (e.g., to address scalability)
- Reuse of VIVO URIs in new contexts and services helps justify disambiguation costs
- Surfacing additional scholarly work through library catalog discovery systems adds visibility and credibility to researchers and to libraries
- LD4L-like projects will help build awareness of best practices for identifiers and data (e.g., ORCID)

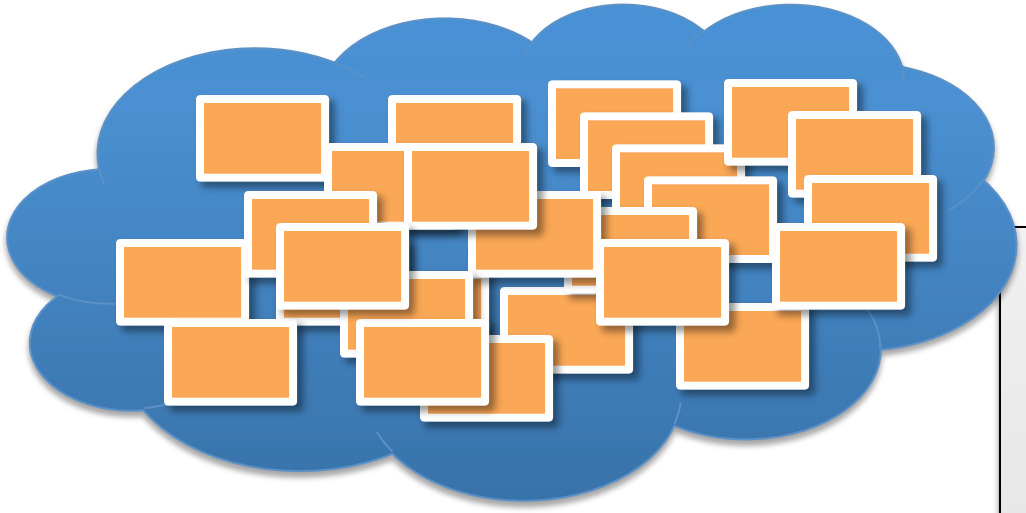
Implications for VIVO projects

- To meet library linked data requirements, VIVO projects will be asked to commit to stable, persistent URIs and data even for people who depart the institution
- Scale, temporal, geographic, and data horizons are bigger
  - Libraries have to think and coordinate globally
  - VIVO is relatively tiny and narrow in scope
- Service interdependencies notch up enterprise-level expectations
- Technologies are not fully mature

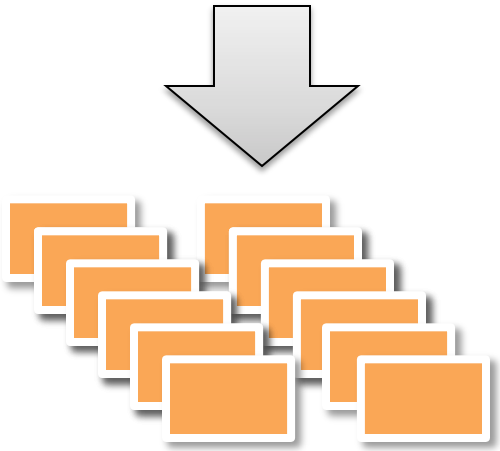
LD4L and the VIVO community

- LD4L has accelerated some discussions common to libraries and VIVO
  - Need for stable, persistent identifiers transcends VIVO and must be solved at a global level
- LD4L has articulated that local original assertions (new vs. copy cataloging) should use local URIs even when global URIs exist
  - This is essential for linked data to work
  - VIVO URIs are in the institutional namespace already
- VIVO data provides many opportunities to demonstrate wider potential
  - E.g., CTSAsearch at University of Iowa (Dave Eichmann)
- Other opportunities will be addressed later in this talk

Use Cases



42 raw use cases



12 refined use cases
in 6 clusters…

LD4L Use Case Clusters

1. Bibliographic + curation data
2. Bibliographic + person data
3. Leveraging external data including authorities
4. Leveraging the deeper graph (via queries or patterns)
5. Leveraging usage data
6. Three-site services, e.g. cross-site search

1.1 Build a virtual collection

- Goal: allowing librarians and patrons to create and share virtual collections by tagging and optionally annotating resources
- Implementations
  - Cornell
  - Stanford

Cornell University L... | Archery in SearchW... | Archery. (Book, 198... | 1999 South Dakota... | World Book Encyclo... | DNB, Katalog der D...
http://localhost:3000/vc/my_virtual_collections/http:%2F%2Flocalhost%2Fag4bed9f37-ef81-4ad4
Search
Most Visited | Mine | CUL-IT | Google | Active Dev | Dev | Terminology | Coursera | Reference | Research Tools | Social

Collection was successfully created. ×

My Virtual Collections

- Linked Data for Libraries
- Archery

Watched Collections

No watched collections. Click ⊕ to find collections to watch.

Archery

⊕ Add External Resource

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Search Results | Cornell U...

http://localhost:3000/?utf8=✓&q=Archery&search_field=all_fields

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My Virtual Collections | Selected Items | Search History | Borrow Direct | Interlibrary Loan

Looking for more?

- Request from Libraries Worldwide (+)
- Search Articles & Full Text (8,186)
- Recommend a Purchase

Refine your results

Access

At the Library	114
Online	81

Format

Book	179
Microform	12
Musical Recording	7
Journal/Periodical	3
Map or Globe	2
Non-musical Recording	2
Manuscript/Archive	1
Video	1

Author/Creator

Publication Year

Language

Subject/Genre

Archery | All Fields | Search

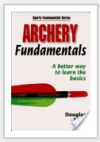
Advanced Search | Search Tips

or Start over

All Fields: Archery ✖

« Previous | 1 - 20 of 195 | Next »

20 per page | Sort by relevance



1. Archery fundamentals c2005

Book Champaign, IL : Human Kinetics, c2005. English

Olin Library Oversize GV1185 .A74 2005 +

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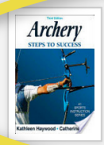

2. Archery : steps to success c2006

Haywood, Kathleen.

Book Champaign, IL : Human Kinetics, c2006. English 3rd ed.

Olin Library Oversize GV1185 .H38 2006 +

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3. Japanese archery [1965]

Nasu, Toshisuke.

Book Rutland, Vt. : C.E. Tuttle Co., [1965] English

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Back to catalog results

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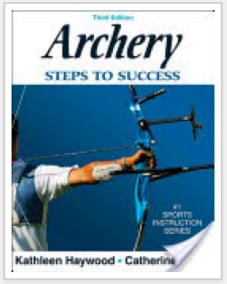
« Previous | 2 of 195 | Next »

Select | Add to Virtual Collection | Email | Export | Print

Linked Data for Libraries
Archery



Archery

steps to success

Kathleen M. Haywood, Catherine F. Lewis

Author/Creator	Haywood, Kathleen.
Format	Book
Language	English
Edition	3rd ed.
Published	Champaign, IL : Human Kinetics, c2006.
Subject	Archery
Description	196 p. : ill. ; 28 cm.
ISBN	0736055428 (soft cover)
Other author/creator	Lewis, Catherine, 1957-

Olin Library | Hours/Map

Oversize GV1185 .H38 2006 + Text

Available 1 copy

Request

Item was successfully created. ×

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- Archery

Watched Collections

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1. Archery : steps to success

Haywood, Kathleen.

Book Champaign, IL : Human Kinetics, c2006. 3rd ed.

Source: Cornell Catalog

Show/Hide Notes and Tags

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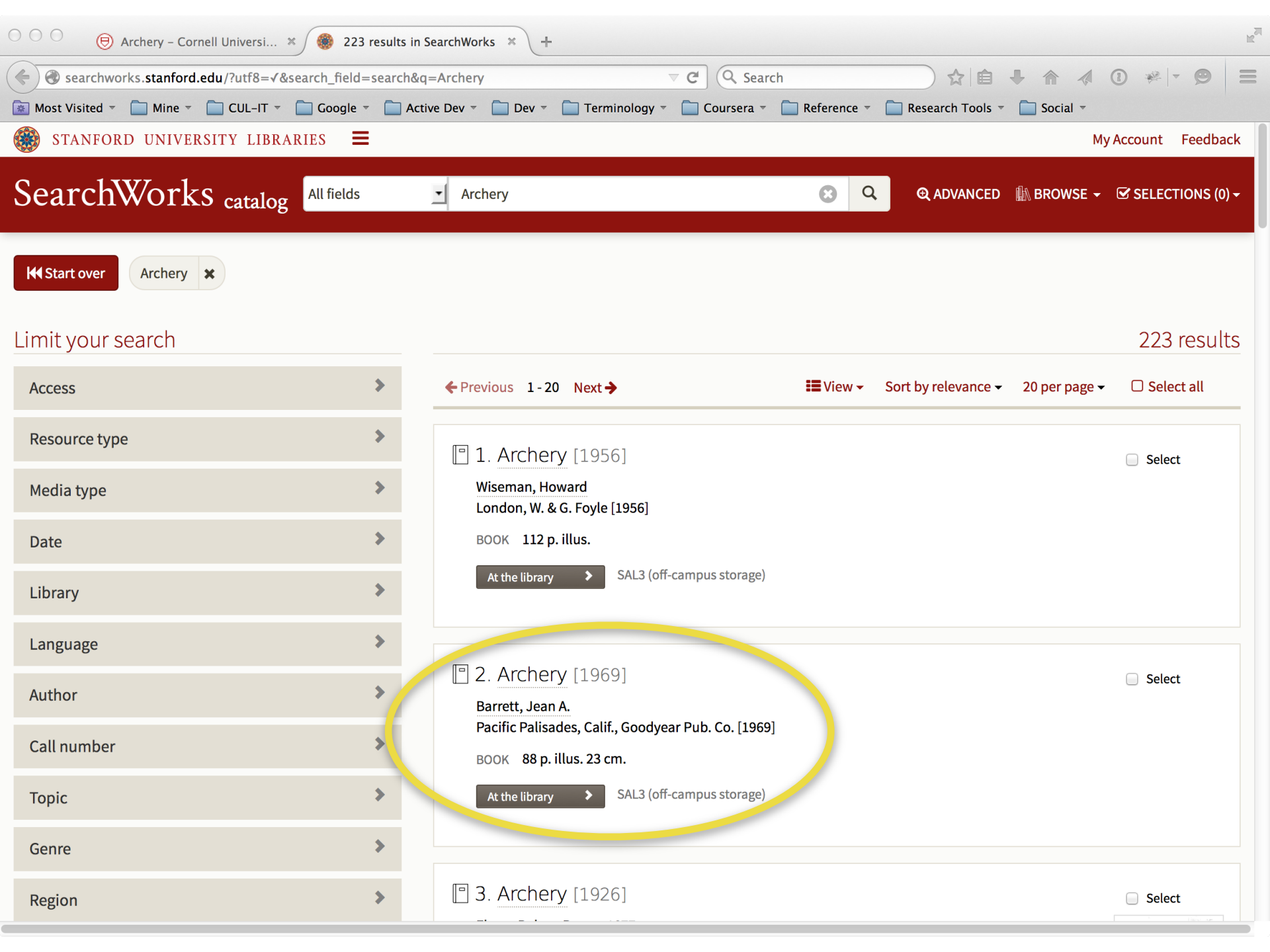
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1. Archery [1956]
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London, W. & G. Foyle [1956]
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2. Archery [1969]
Barrett, Jean A.
Pacific Palisades, Calif., Goodyear Pub. Co. [1969]
BOOK 88 p. illus. 23 cm.
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3. Archery [1926]
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STANFORD UNIVERSITY LIBRARIES
My Account | Feedback
SearchWorks catalog
All fields
ADVANCED | BROWSE | SELECTIONS (0)

Archery

AUTHOR/CREATOR	Barrett, Jean A.
LANGUAGE	English.
IMPRINT	Pacific Palisades, Calif., Goodyear Pub. Co. [1969]
PHYSICAL DESCRIPTION	88 p. illus. 23 cm.

SAL3 (off-campus storage)
No public access

Stacks Request
371.3615 .B274

More options

Find it at other libraries via WorldCat

Contents/Summary

BIBLIOGRAPHY
Bibliography: p. [87]-88.

Subjects

SUBJECT
Archery.

Bibliographic information

PUBLICATION DATE
1969

RESPONSIBILITY
[by] Jean A. Barrett.

SERIES
Goodyear physical activities series

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My Virtual Collections

- Linked Data for Libraries
- Archery

Watched Collections

No watched collections. Click ⊕ to find collections to watch.

Archery

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1. Archery : steps to success — Remove

Haywood, Kathleen.

Book Champaign, IL : Human Kinetics, c2006. 3rd ed.

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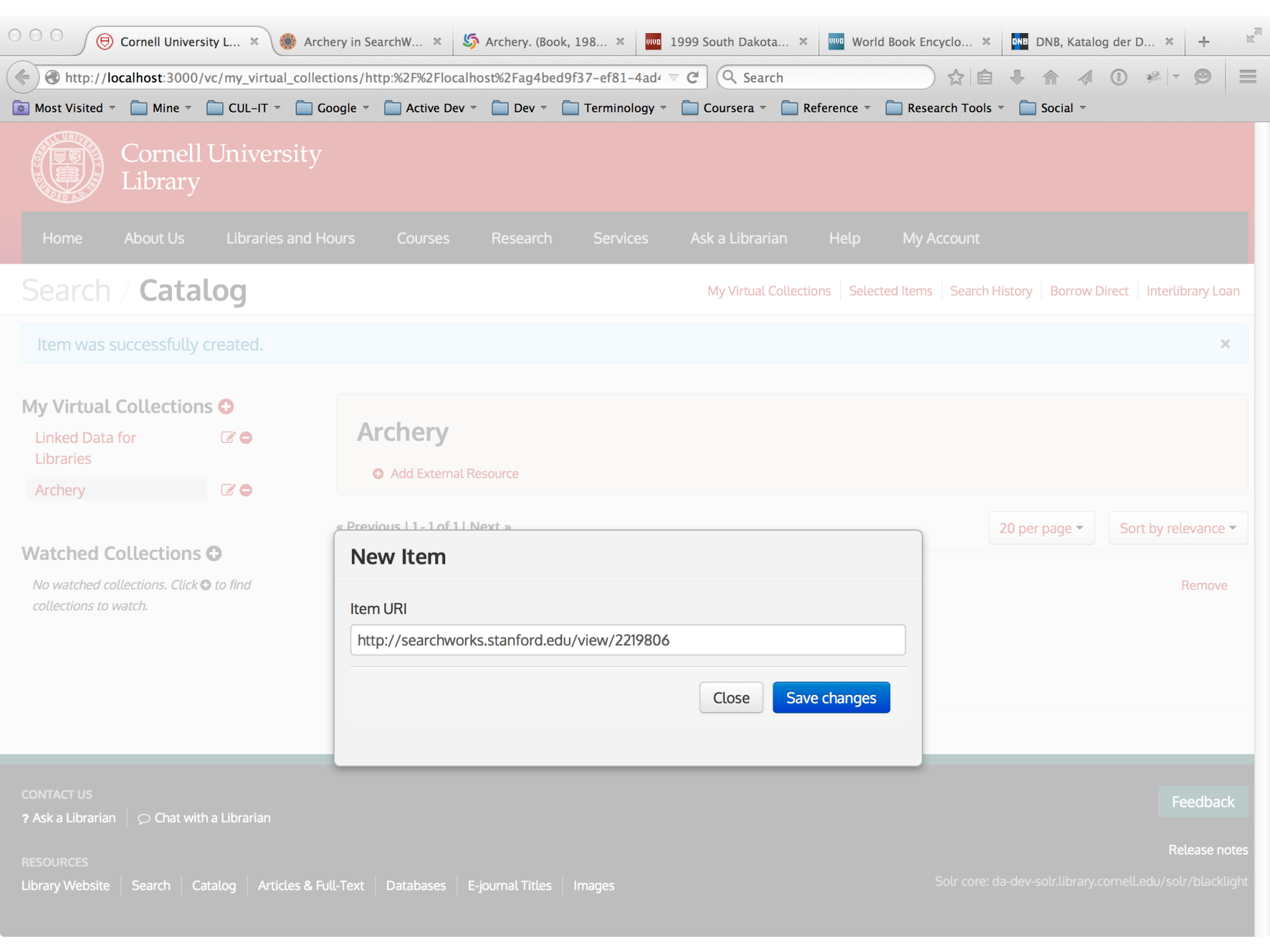
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Watched Collections
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Images
Release notes
Solr core: da-dev-solr.library.cornell.edu/solr/blacklight

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1. Archery : steps to success — Remove

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Source: Cornell Catalog

Show/Hide Notes and Tags

2. Archery [1969] — Remove

Barrett, Jean A.

Book Pacific Palisades, Calif., Goodyear Pub. Co. 1969

Source: Stanford Catalog

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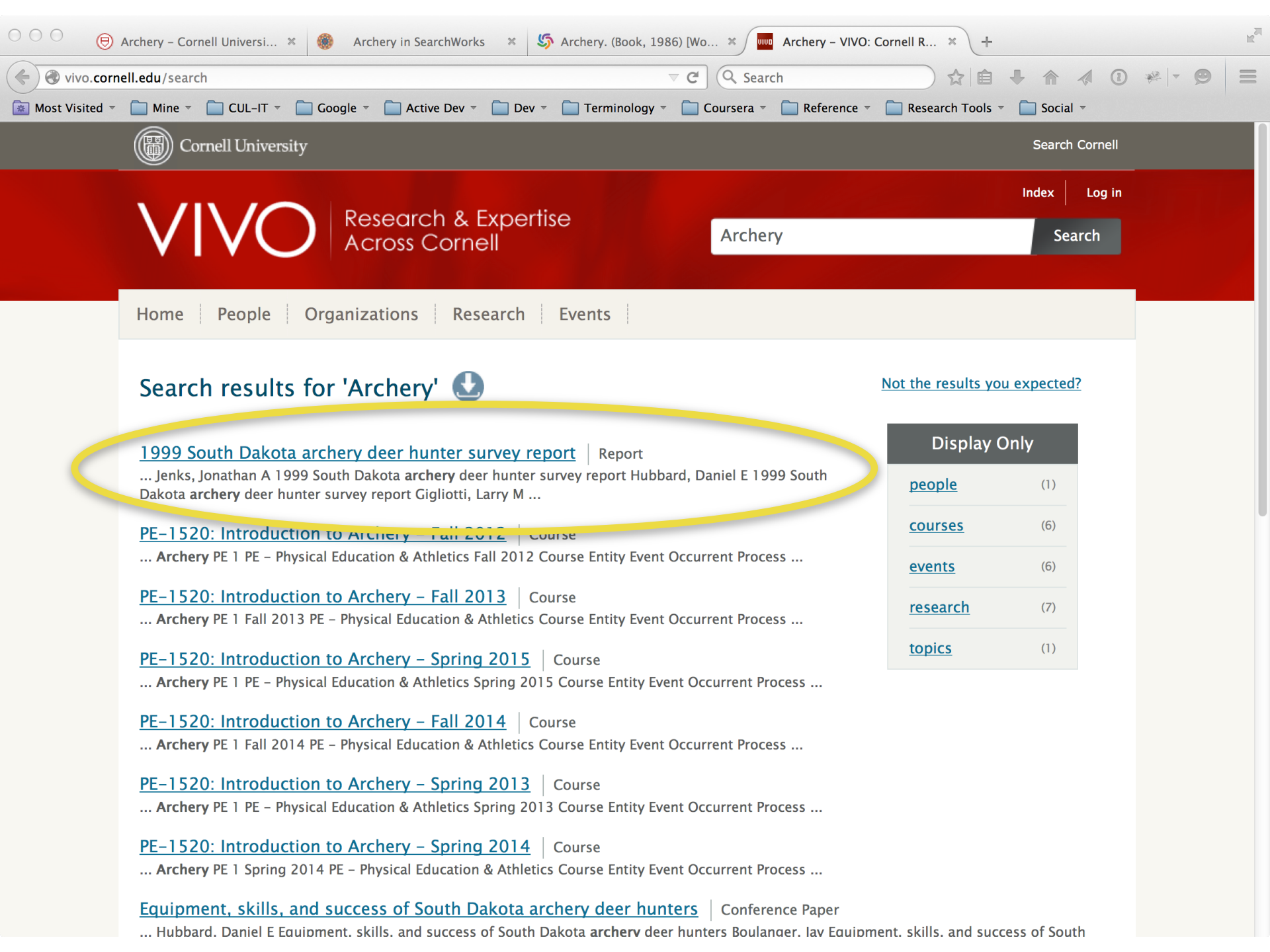
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... Archery PE 1 PE – Physical Education & Athletics Fall 2012 Course Entity Event Occurrent Process ...
PE-1520: Introduction to Archery – Fall 2013 | Course
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... Archery PE 1 Spring 2014 PE – Physical Education & Athletics Course Entity Event Occurrent Process ...
Equipment, skills, and success of South Dakota archery deer hunters | Conference Paper
... Hubbard, Daniel E Equipment, skills, and success of South Dakota archery deer hunters Boulanger, Jay Equipment, skills, and success of South
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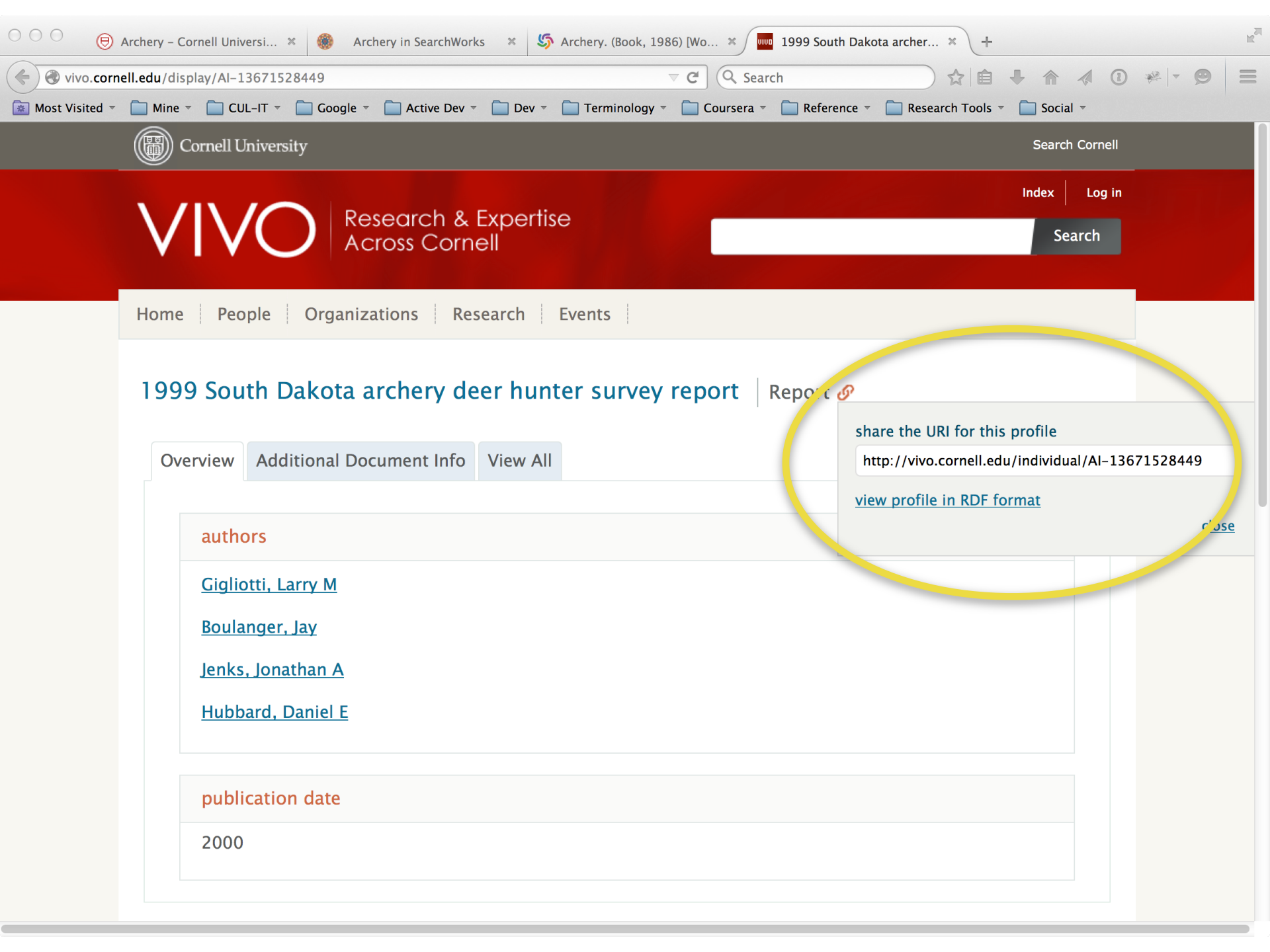
courses (6)
events (6)
research (7)
topics (1)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Events
1999 South Dakota archery deer hunter survey report
Report
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view profile in RDF format
close
Overview
Additional Document Info
View All
authors
Gigliotti, Larry M
Boulanger, Jay
Jenks, Jonathan A
Hubbard, Daniel E
publication date
2000

My Virtual Collections

- Linked Data for Libraries
- Archery

Watched Collections

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Archery

Add External Resource

« Previous | 1 - 4 of 4 | Next »

20 per page | Sort by relevance

1. Archery : steps to success — Remove

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Book Champaign, IL : Human Kinetics, c2006. 3rd ed.

Source: Cornell Catalog

Show/Hide Notes and Tags

2. Archery [1969] — Remove

Barrett, Jean A.

Book Pacific Palisades, Calif., Goodyear Pub. Co. 1969

Source: Stanford Catalog

Show/Hide Notes and Tags

3. Archery. 1986 — Remove

Book default : default, 1986 en 1986 revision.

Source: OCLC Worldcat

Show/Hide Notes and Tags

4. 1999 South Dakota archery deer hunter survey report — Remove

Book

Source: Cornell VIVO

Show/Hide Notes and Tags

1.2 Tag scholarly information resources to support reuse

- Goal: provide librarians tools to create and manage larger online collections of catalog resources
- Implementation
  - More automation
  - Batch processes as well as individual editing
  - Working to replace CuLLR

My Virtual Collections

- Linked Data for Libraries
- Archery

Watched Collections

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Archery

Add External Resource

« Previous | 1 - 6 of 6 | Next »

20 per page | Sort by relevance

1. Archery : steps to success — Remove

Haywood, Kathleen.

Book Champaign, IL : Human Kinetics, c2006. 3rd ed.

Source: Cornell Catalog

Show/Hide Notes and Tags

Note:

This is an excellent resource on archery technique.

Set Note Reset

Tags:

archery; technique

NOTE: Separate tags with semicolons.

Set Tags Reset

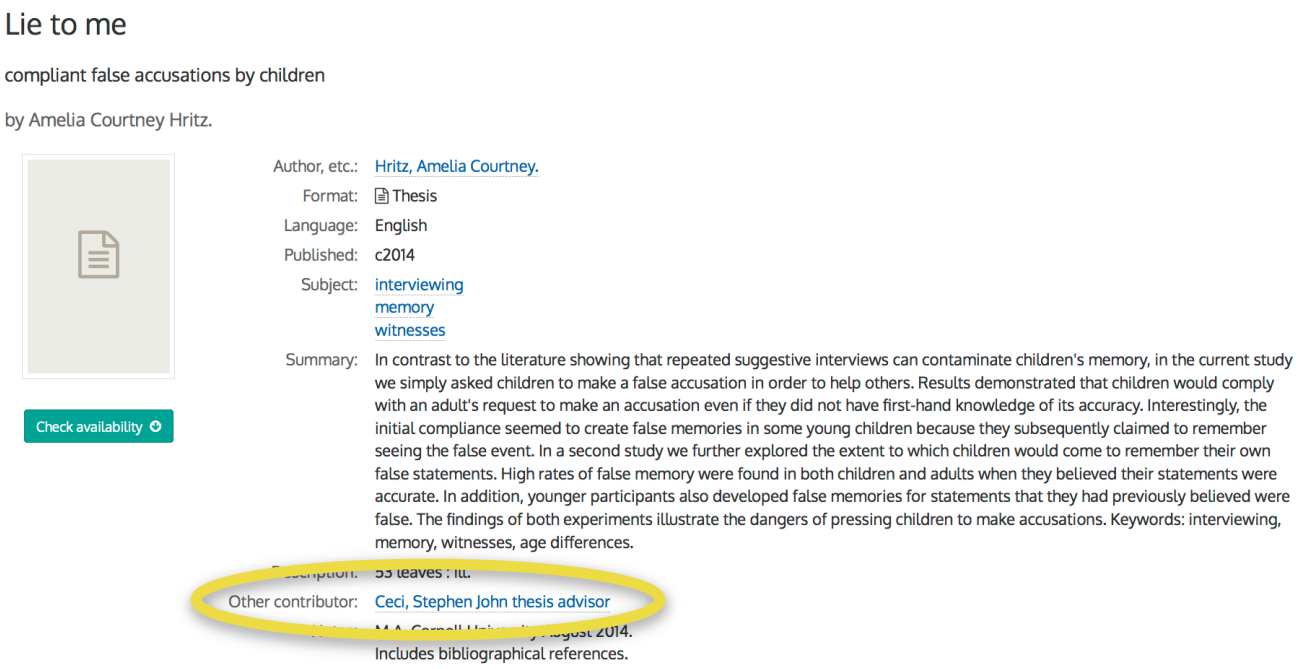
2. Archery [1969] — Remove

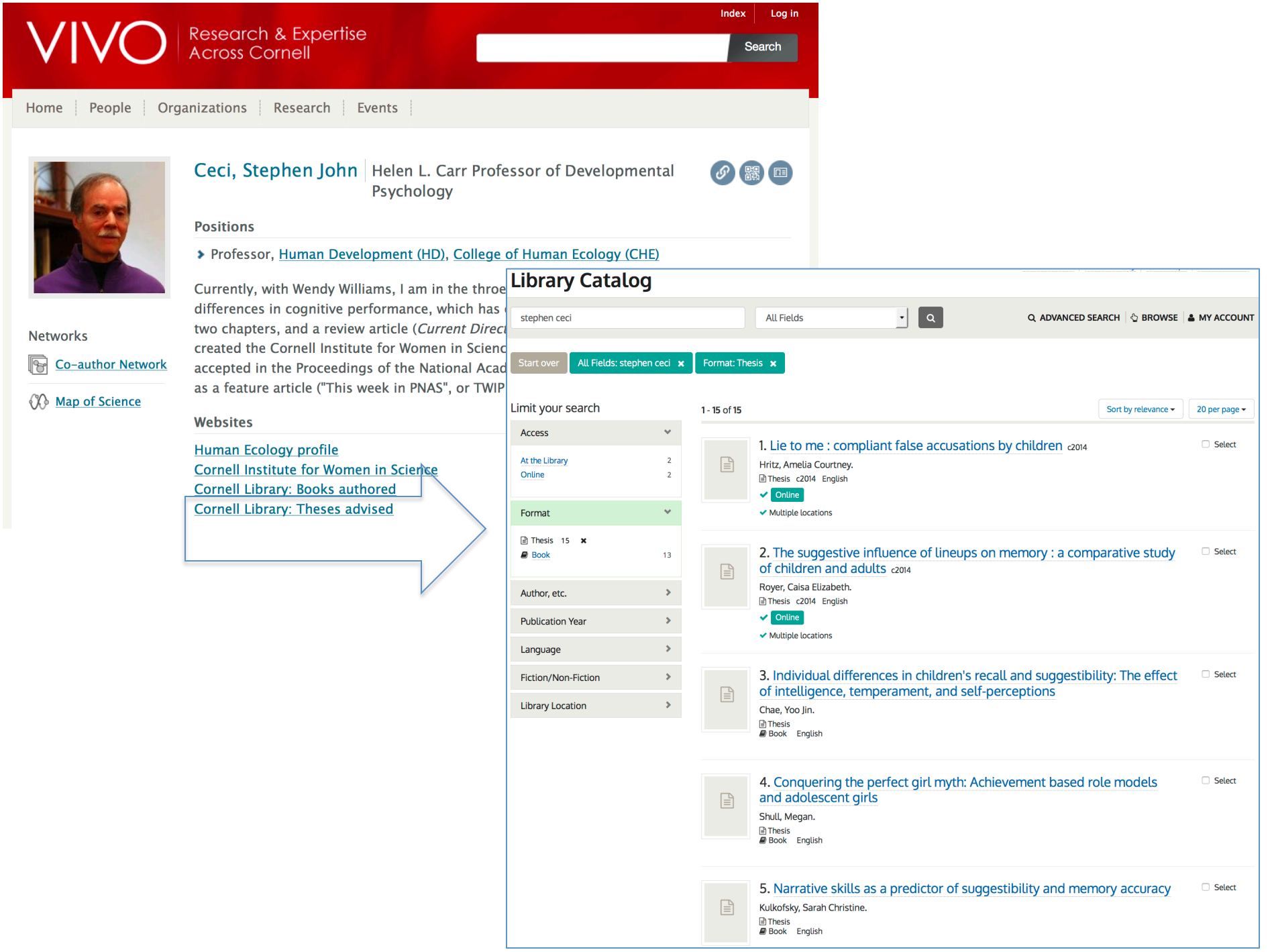
2.1 See and search on works by people to discover more works and better understand people

- Goal: link catalog search results to the three researcher networking systems to provide current articles, courses
- Implementation
  - Adding VIVO URIs to MARC records for thesis advisors
  - Adding links to VIVO records linking back to faculty works and their students' theses
  - Raises important issues about URI stability

Thesis Advisors and VIVO

- Cornell Technical Services is including thesis advisors in MARC records using NetIDs from the Graduate school database e.g., 700 1 ‡a Ceci, Stephen John ‡e thesis advisor ‡0
- Advisors are looked up against VIVO to get URIs for the faculty members




VIVO
Research & Expertise Across Cornell
Index
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Organizations
Research
Events
Ceci, Stephen John
Helen L. Carr Professor of Developmental Psychology
Positions
Professor, Human Development (HD), College of Human Ecology (CHE)
Currently, with Wendy Williams, I am in the throe
differences in cognitive performance, which has
two chapters, and a review article (Current Direct
created the Cornell Institute for Women in Scienc
accepted in the Proceedings of the National Acad
as a feature article ("This week in PNAS", or TWIP
Networks
Co-author Network
Map of Science
Websites
Human Ecology profile
Cornell Institute for Women in Science
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Format: Thesis
Limit your search
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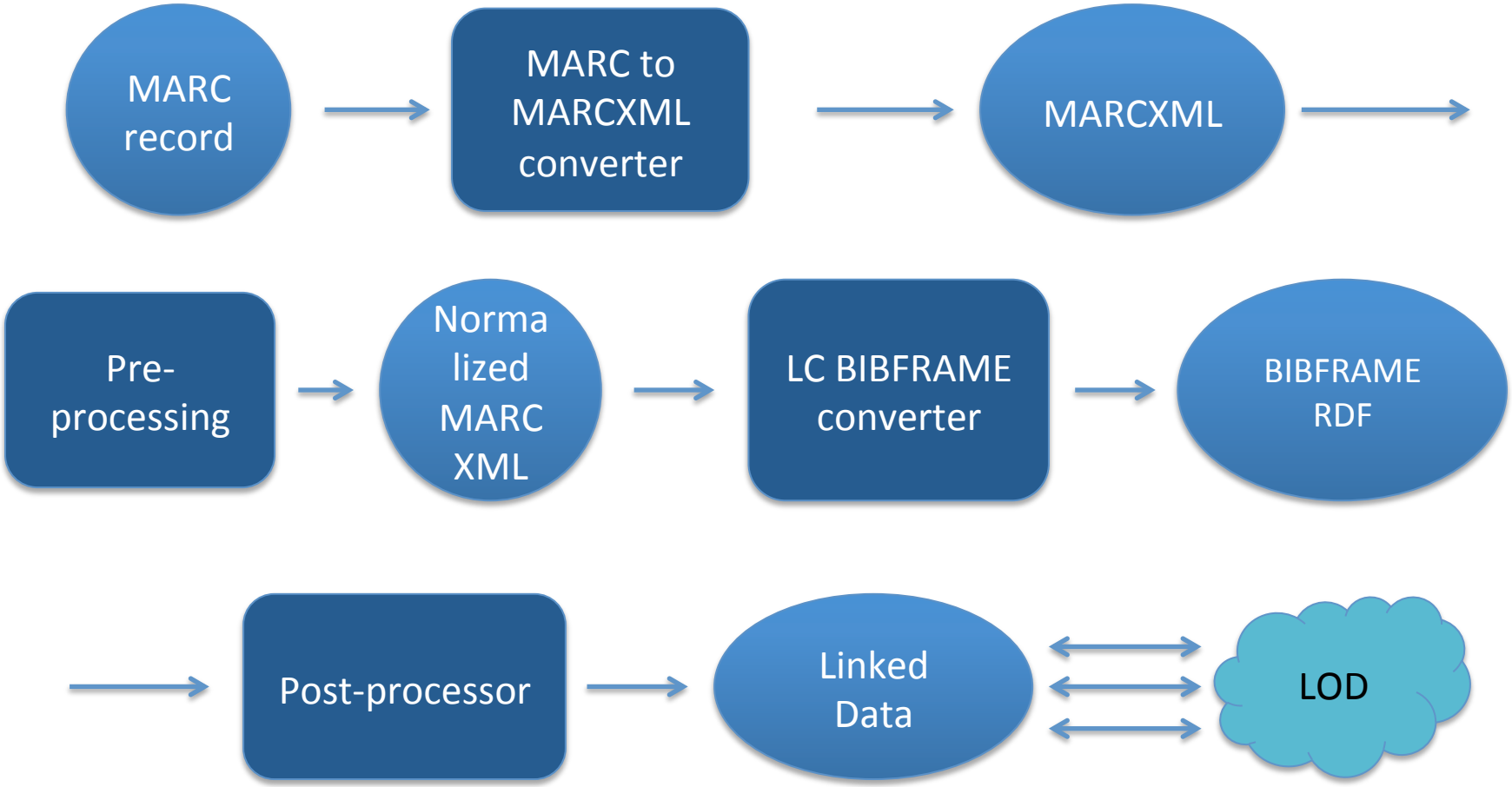
Thesis 15
Book 13
Author, etc.
Publication Year
Language
Fiction/Non-Fiction
Library Location
1 - 15 of 15
Sort by relevance
20 per page
1. Lie to me : compliant false accusations by children c2014
Hritz, Amelia Courtney.
Thesis c2014 English
Online
Multiple locations
Select
2. The suggestive influence of lineups on memory : a comparative study of children and adults c2014
Royer, Caisa Elizabeth.
Thesis c2014 English
Online
Multiple locations
Select
3. Individual differences in children's recall and suggestibility: The effect of intelligence, temperament, and self-perceptions
Chae, Yoo Jin.
Thesis
Book English
Select
4. Conquering the perfect girl myth: Achievement based role models and adolescent girls
Shull, Megan.
Thesis
Book English
Select
5. Narrative skills as a predictor of suggestibility and memory accuracy
Kulkofsky, Sarah Christine.
Thesis
Book English
Select

Stages of data transformation



Sample post-processor functions

- Asserts that the bf:Work is an ld4l:Thesis
- Creates foaf:Person from thesis author
- Creates foaf:Person from thesis advisor
  - Re-uses VIVO URI rather than minting a new URI
- Creates foaf:Organization from degree-granting institution

Future post-processing challenges

- Scale up to real world magnitude of library catalog data
- Extend to full variety of different types of catalog records
- Address issues of entity resolution and linking in the real world for works, people, organizations, events, places, and subjects
- Integrate catalog updates into existing triplestore

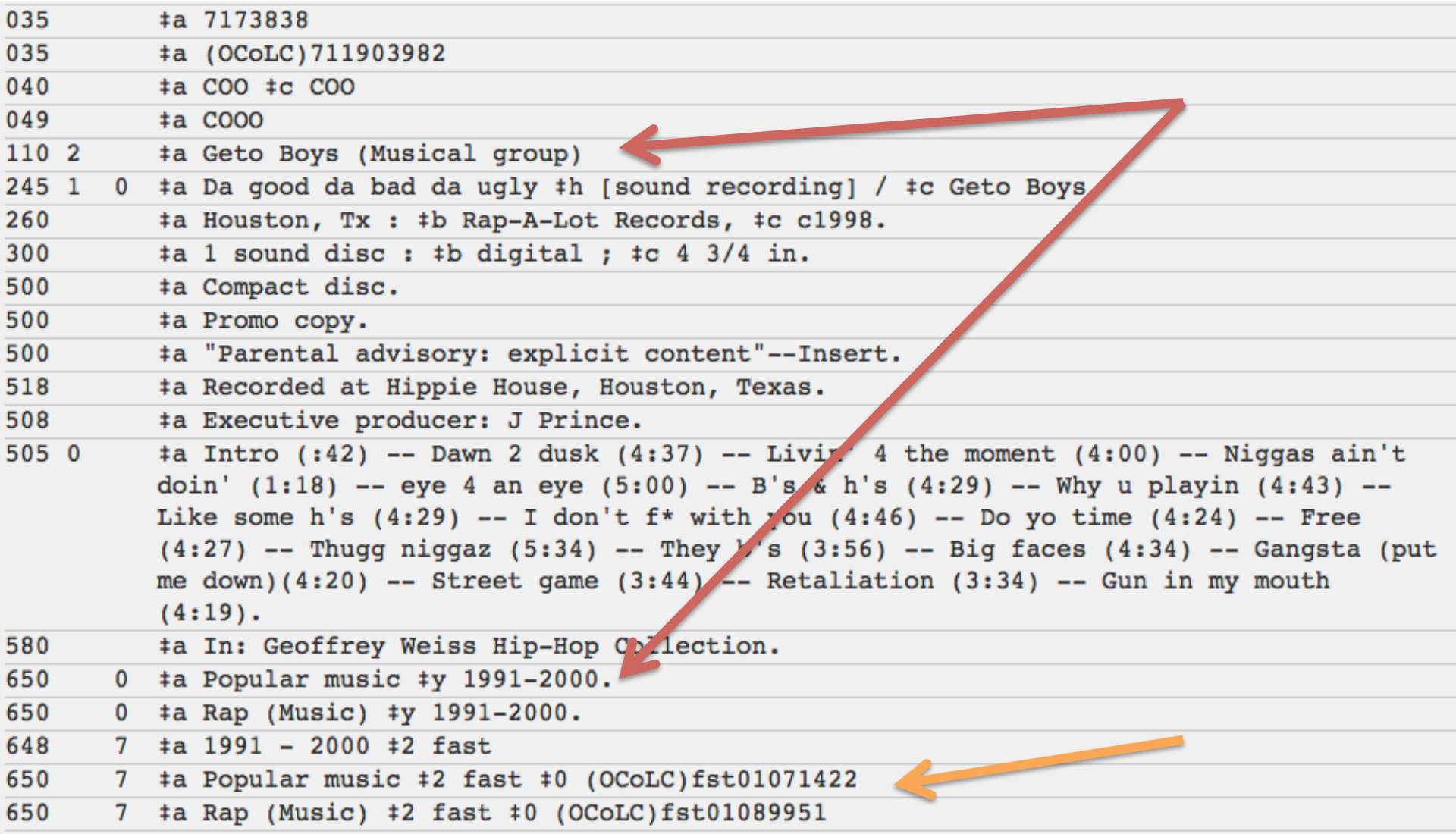
3.1 Search with geographic data for record enrichment and pivoting

- Goal: leverage geographic subject headings to link catalog resources to each other and to other linked data
- Implementation:
  - Paolo Ciccarese experimental alignment with DBpedia

3.2 Search with subject data for record enrichment and pivoting

- Goal: as with geographic linkages, improve alignment of records to facilitate
- Implementation:
  - Adding OCLC FAST subject headings to MARC records
    - More straightforwardly hierarchical than LCSH with combinations of 3 headings

MARC record with FAST headings



```
035          ‡a 7173838
035          ‡a (OCoLC)711903982
040          ‡a COO ‡c COO
049          ‡a COOO
110 2        ‡a Geto Boys (Musical group)
245 1  0     ‡a Da good da bad da ugly ‡h [sound recording] / ‡c Geto Boys
260          ‡a Houston, Tx : ‡b Rap-A-Lot Records, ‡c c1998.
300          ‡a 1 sound disc : ‡b digital ; ‡c 4 3/4 in.
500          ‡a Compact disc.
500          ‡a Promo copy.
500          ‡a "Parental advisory: explicit content"--Insert.
518          ‡a Recorded at Hippie House, Houston, Texas.
508          ‡a Executive producer: J Prince.
505 0        ‡a Intro (:42) -- Dawn 2 dusk (4:37) -- Livin' 4 the moment (4:00) -- Niggas ain't
             doin' (1:18) -- eye 4 an eye (5:00) -- B's & h's (4:29) -- Why u playin (4:43) --
             Like some h's (4:29) -- I don't f* with you (4:46) -- Do yo time (4:24) -- Free
             (4:27) -- Thugg niggaz (5:34) -- They h's (3:56) -- Big faces (4:34) -- Gangsta (put
             me down)(4:20) -- Street game (3:44) -- Retaliation (3:34) -- Gun in my mouth
             (4:19).
580          ‡a In: Geoffrey Weiss Hip-Hop Collection.
650    0     ‡a Popular music ‡y 1991-2000.
650    0     ‡a Rap (Music) ‡y 1991-2000.
648    7     ‡a 1991 - 2000 ‡2 fast
650    7     ‡a Popular music ‡2 fast ‡0 (OCoLC)fst01071422
650    7     ‡a Rap (Music) ‡2 fast ‡0 (OCoLC)fst01089951
```

3.3 Search with person data for record enrichment and pivoting

- Goal: identify and link to reliable person records for authors beyond the home institution
- Implementation:
  - Stanford has tested the ability to resolve chains of identifiers including id.loc.gov, VIAF, and ISNI
  - Catalog record vendors have expressed willingness to include some enhancement in their services
  - Some identifiers change as better information becomes available
  - Institutional membership in ISNI allows access to provisional records for review and correction

Authorities with URIs (Stanford)

001		nr 91001286
003		DLC
005		20141023130734.0
008		910111n| azannaabn**********|n*aaa**** c
010		nr 91001286
035		(OCoLC)oca02877475
040		NjP|beng|cNjP|dlEN-Mu|dUPB|erda|dDLC
046		|f1967
100	1	Applebaum, Mark
370		Chicago, Ill.
372		Jazz
374		Pianists|2lcsh
374		Composers|2lcsh
375		male
670		His Your parents hate me [SR] c1989:|bt.p. (Mark Applebaum)
670		Applebaum, M. 56 1/2 ft. [SR] p2005:|blabel (Mark Applebaum) insert (b. 1967, Chicago; composer and jazz pianist)
920		http://id.loc.gov/authorities/names/nr91001286
921		http://viaf.org/viaf/74157420
922		http://www.isni.org/0000000051964951

3.4 Authority tool for more accurate data entry

- Goal: guidance for catalogers' controlled vocabulary choices influenced by a project's ontology and vocabulary(ies)
- Implementation
  - Cornell has developed a SKOS flavor of Vitro to support creation, editing, and service provision for controlled vocabularies to VIVO or other apps
  - Cornell looking at Vitro for BIBFRAME content creating and editing
    - Evaluating LD4L BIBFRAME ontology for both converted MARC records and de novo cataloging
    - Supplementing ontology axioms as domains require
    - Connecting to external vocabularies and sources of definitive entity URIs

4.1 Identifying related works

- Goal: finding additional resources beyond those directly related to any single work using queries or patterns, as for example changes in illustrations over a series of editions of a work
- Implementation
  - Explored by modeling non-MARC metadata from Cornell Hip Hop Flyer collection using LinkedBrainz
  - Availability of data will influence richness of discoverable context

Hip Hop flyers

Pilot: linking Hip Hop flyer metadata to MusicBrainz/LinkedBrainz data

- Model non-MARC metadata from Cornell Hip Hop Flyer Collection in RDF
  - Test LD4L BIBFRAME for describing flyers originally catalogued using ARTstor's Shared Shelf
  - Use Getty Art & Architecture Thesaurus to create bf:Work sub-classes
  - Test the use of other ontologies for describing other entities including Event ontology and Schema.org

- Use of URIs for performers to recursively discover relationships to other entities via dates, events, venues, graphic designers, work types and categories
  - Mostly local authorities for performers, rarely represented by LCNAF or other name authorities

MusicBrainz

Afrika Bambaataa

~ Person

Overview | Releases | Recordings | Works | Events | Relationships | Aliases | Tags | Details | Edit

Legal name: Kevin Donovan

Wikipedia

Kevin Donovan (born April 19, 1957), better known by the stage name **Afrika Bambaataa**, is an American DJ from the South Bronx, New York. He is notable for releasing a series of genre-defining electro tracks in the 1980s that influenced the development of hip hop culture. Afrika Bambaataa is one of the originators of breakbeat DJing and is respectfully known as "The Godfather" and "Amen Ra of Hip Hop Kulture," as well as the father of electro funk. Through his co-opting of the street gang the Black Spades into the music and culture-oriented Universal Zulu Nation, he has helped spread Hip Hop Culture throughout the world.

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Filter

Discography

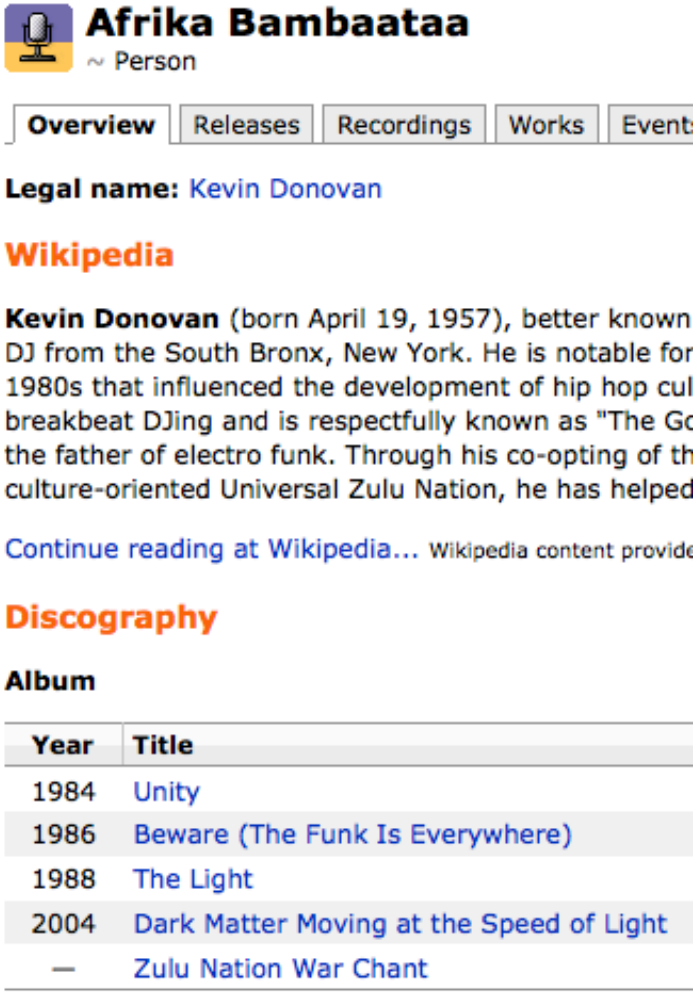
Album

Year	Title	Artist	Rating	Releases
1984	Unity	Afrika Bambaataa & James Brown	★☆☆☆☆	1
1986	Beware (The Funk Is Everywhere)	Afrika Bambaataa	★☆☆☆☆	2
1988	The Light	Afrika Bambaataa	★☆☆☆☆	1
2004	Dark Matter Moving at the Speed of Light	Afrika Bambaataa	★★☆☆☆	2
—	Zulu Nation War Chant	Afrika Bambaataa	★☆☆☆☆	1

Album + Compilation

Year	Title	Artist	Rating	Releases
1997	Zulu Groove	Afrika Bambaataa	★★★☆☆	1
1999	Electro Funk Breakdown	Afrika Bambaataa	★★★☆☆	2
1999	The 12" Mixes	Afrika Bambaataa	★☆☆☆☆	1
2001	Looking for the Perfect Beat 1980-1985	Afrika Bambaataa	★★★★★	3
2003	Afrika Bambaataa Presents Eastside	Afrika Bambaataa	★☆☆☆☆	1

Reconciling mo:Release with bf:Audio



Afrika Bambaataa

~ Person

Overview | Releases | Recordings | Works | Event

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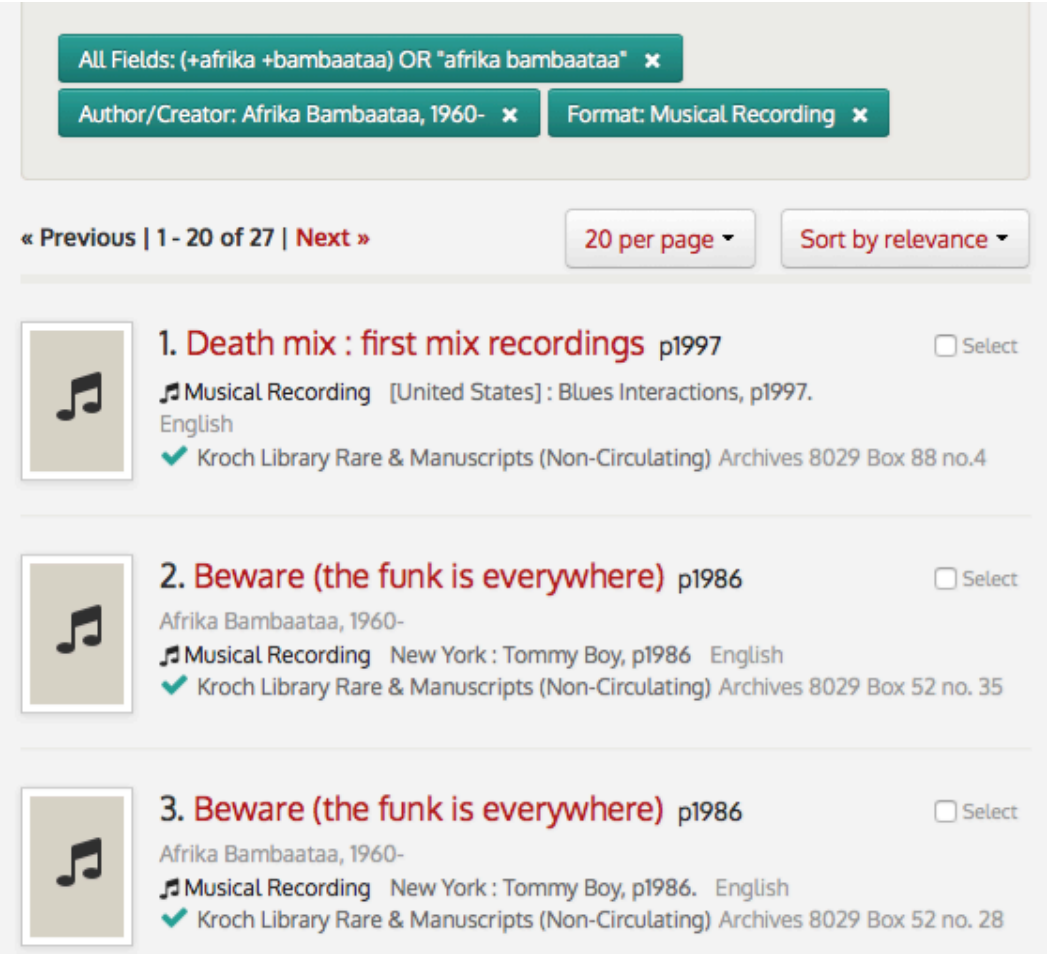
the father of electro funk. Through his co-opting of th
culture-oriented Universal Zulu Nation, he has helped

Continue reading at Wikipedia... Wikipedia content provide

Discography

Album

Year	Title
1984	Unity
1986	Beware (The Funk Is Everywhere)
1988	The Light
2004	Dark Matter Moving at the Speed of Light
—	Zulu Nation War Chant



All Fields: (+afrika +bambaataa) OR "afrika bambaataa" ×

Author/Creator: Afrika Bambaataa, 1960- × | Format: Musical Recording ×

« Previous | 1 - 20 of 27 | Next »

20 per page | Sort by relevance

1. Death mix : first mix recordings p1997 Select
Musical Recording [United States] : Blues Interactions, p1997.
English
Kroch Library Rare & Manuscripts (Non-Circulating) Archives 8029 Box 88 no.4

2. Beware (the funk is everywhere) p1986 Select
Afrika Bambaataa, 1960-
Musical Recording New York : Tommy Boy, p1986 English
Kroch Library Rare & Manuscripts (Non-Circulating) Archives 8029 Box 52 no. 35

3. Beware (the funk is everywhere) p1986 Select
Afrika Bambaataa, 1960-
Musical Recording New York : Tommy Boy, p1986. English
Kroch Library Rare & Manuscripts (Non-Circulating) Archives 8029 Box 52 no. 28

Takeaways

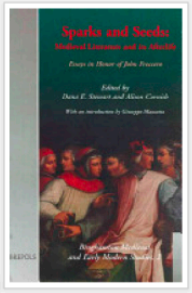
- Able to map large parts of our metadata to RDF using multiple ontologies to discover more relationships to more entities (still some mapping and reconciliation work to do)
- Largely predicated on manual workflows for preprocessing, URI lookups, and unstable software for RDF creation
- Need more URIs for both linking to and linking from in order to take advantage of queries and patterns

4.2 Leverage the deeper graph to surface more relevant works

- Goal: extend the use of contextually related information to influence relevance ranking
- Implementation:
  - Leverage alignment of WorldCAT bibliographic identifiers to OCLC Works in post-processing BIBFRAME converted from MARC
  - Compare alignment across 3 institutions to reduce redundancy and potentially influence relevance ranking

With the matching work identifiers, we can create a relationship between two records for the same work.

Work: 891526327



Sparks and seeds

medieval literature and its afterlife : essays in honor of John Freccero

edited by Dana E. Stewart and Alison Cornish ; with an introduction by Giuseppe Mazzotta.

Format	Book
Language	English
Published	Turnhout, Belgium : Brepols, c2000.
Subject	Dante Alighieri, 1265-1321 > Criticism and interpretation Literature, Medieval > History and criticism Italian literature > To 1400 > History and criticism Aesthetics, Medieval, in literature
Description	x, 347 p. ; 24 cm.
ISBN	2503509061
Other author/creator	Freccero, John. Stewart, Dana E. Cornish, Alison, 1963-

Availability

Olin Library

PQ4390 .S63 2000 Text

Available 1 copy

Request

At the Library: Olin Library

Online: Brepols Miscellanea

Sparks and Seeds

Medieval Literature and Its Afterlife. Essays in Honor of John Freccero

Author/Creator	Stewart, Dana E.
Format	Book
Language	English
Published	B-2300 Turnhout : Brepols Publishers Jan. 2000 Birmingham : Metapress [Distributor]
Description	1 online resource.
ISBN	9782503538006 2503538002 (E-Book)
Other author/creator	Cornish, Alison Author

Availability

Available online

Brepols Miscellanea Online - Archive
Connect to text.

Restrictions
License restrictions may limit access.

Search Libraries Worldwide for a print copy.

Librarian View | Classic Catalog

Work ID to bib ID distribution

The table shows the number of our records (bibs) that share a single work id, and the number of work id sets with each number of bibs. Most bibs connect to a work id that no other bibs share, but there are very promising numbers of sets of bibs.

Bibs	Sets
1	5,268,186
2	520,135
3	69,426
4	24,537
5	9,151
6	4,793
7	2,671
8	1,671
9	1,015
10	743
11	551
12	447
13	324
14	260

Bibs	Sets
15	216
16	180
17	133
18	120
19	94
20	82
21	72
22	69
23	63
24	52
25	45
26	34
27	50
28	24

Bibs	Sets
29	23
30	31
31	23
32	10
33	14
34	26
35	19
36	18
37	10
38	11
39	10
40	8
41	7
42	7

Bibs	Sets
43	8
44	9
45	3
46	11
47	5
48	4
49	4
50	3
51	7
52	3
53	8
54	3
55	1
56	5

...

Source: Frances Webb, Cornell University Library

5.1 Research guided by community usage

- Goals: find what is being read, annotated, bought by libraries, etc. by scholarly communities not only at my institution but at others, and to find sources used elsewhere but not by my community
- Implementation
  - Stack scores at Harvard supporting Stacklife
  - Extend same approach at Cornell, avoiding any specific patron information to maintain privacy

StackLife

Click a book to dive into the stacks

Search

Go!

Advanced Search

Welcome to StackLife, a new way to browse the Harvard Library collection.

This is a prototype. We're eager to hear from you about what works, what doesn't, and what you'd like to see. Email us at lil@law.harvard.edu!

How it works

About

http://stacklife.harvard.edu/

5.2 Be guided in collection building by usage

- Goal: guide collection development based on usage at local and remote institutions, whether in concert or differentially
- Implementation
  - Anticipated as a business analytics tool helping to guide the application of increasingly limited funds for acquisition
  - Perhaps most useful to find gaps in local collections where strong usage occurs elsewhere

6.1 Cross-site search

- Goal: extend local search beyond local collection boundaries without losing the detailed coverage of special collections, ideally influenced by scholarly value and not simply popularity in the public eye
- Implementation
  - Focused first on scalability of triple stores and alignment using OCLC Works
  - Exposing as linked data will enable independent harvesting to index as desired across multiple sites

Assembling the Ontology

Identifying data sources

- Bibliographic data: CUL/Harvard/SUL catalogs
- Person data: VIVO, Stanford CAP, Profiles
- Usage data: LibraryCloud, Cornell/Stanford circulation, BorrowDirect circulation
- Collections: Archival EAD, IRs, SharedShelf, Olivia, arbitrary OAI-PMH
- Annotations: Cornell CuLLR, Stanford DMS, Bloglinks, DBpedia, LibGuides
- Subjects & Authorities

BIBFRAME

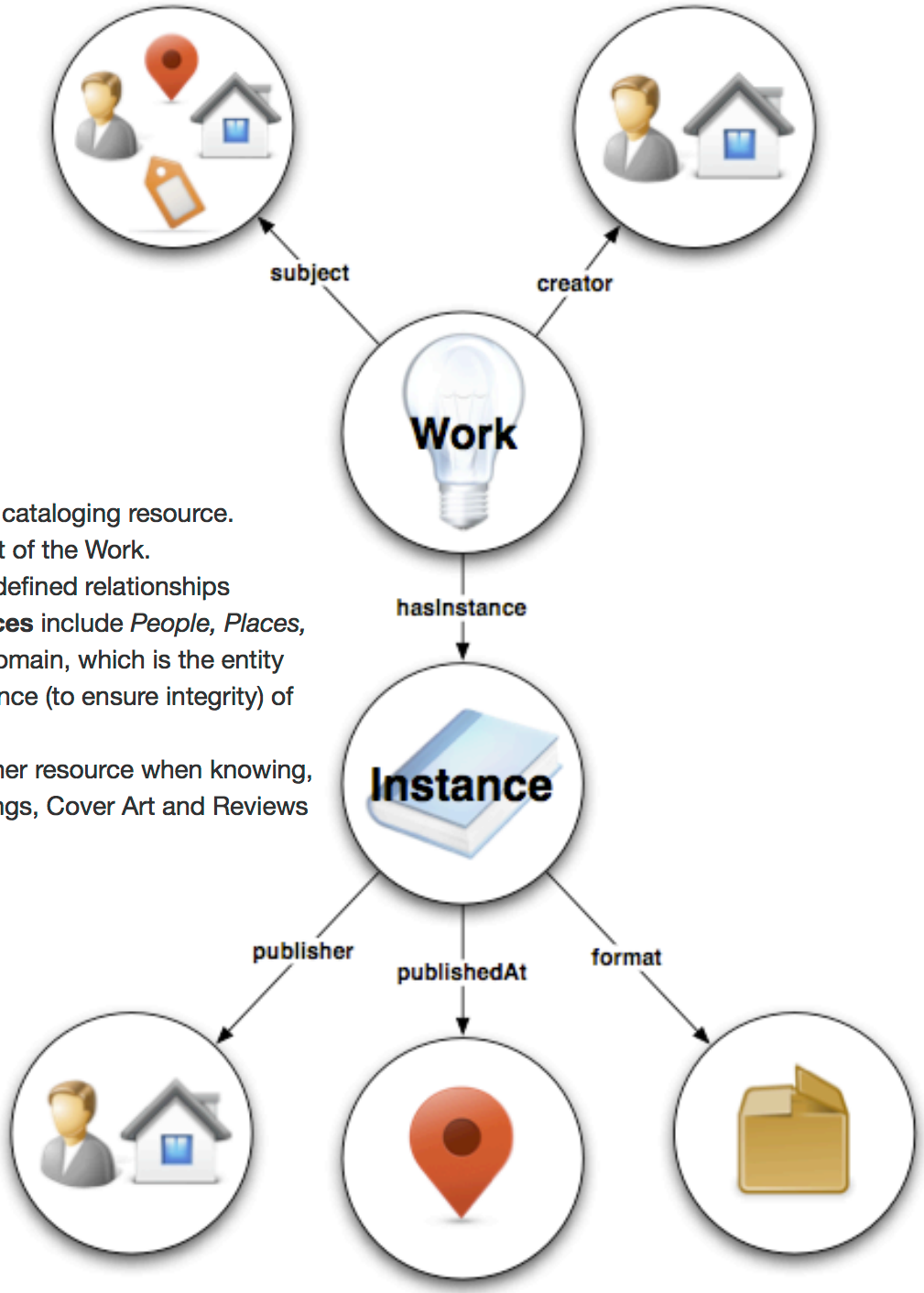
- The Library of Congress (LoC) has developed the BIBFRAME ontology as an (eventual) replacement for MARC, the current cataloging standard for library resources
- LoC has developed and continues to refine a converter that produce BIBFRAME RDF from MARC XML
  - Vendors will likely follow suit

http://bibframe.org/

BIBFRAME basic entities and relationships

- **Creative Work** - a resource reflecting a conceptual essence of the cataloging resource.
- **Instance** - a resource reflecting an individual, material embodiment of the Work.
- **Authority** - a resource reflecting key authority concepts that have defined relationships reflected in the Work and **Instance**. Example of **Authority Resources** include *People, Places, Topics, Organizations,* etc. One important concept in Authority is domain, which is the entity taking responsibility for the recognition, organization and maintenance (to ensure integrity) of the authoritative resources.
- **Annotation** - a resource that enhances our knowledge about another resource when knowing, minimally, 'who' is doing the annotating is important. Library Holdings, Cover Art and Reviews are examples types.

http://bibframe.org/vocab-model/



BIBFRAME evolution

- LoC initial focus on capturing and representing MARC, not on connecting to LOD cloud
- LoC converter is de-facto spec for MARC-> BIBFRAME, but requires pre/post-processing for full LOD interoperability
- LD4L has provided feedback via a report compiled by Rob Sanderson from Stanford and a modified bibframe.ld4l.org ontology
- Ongoing discussions of issues such as held items, titles, serials on the LoC BIBFRAME listserv

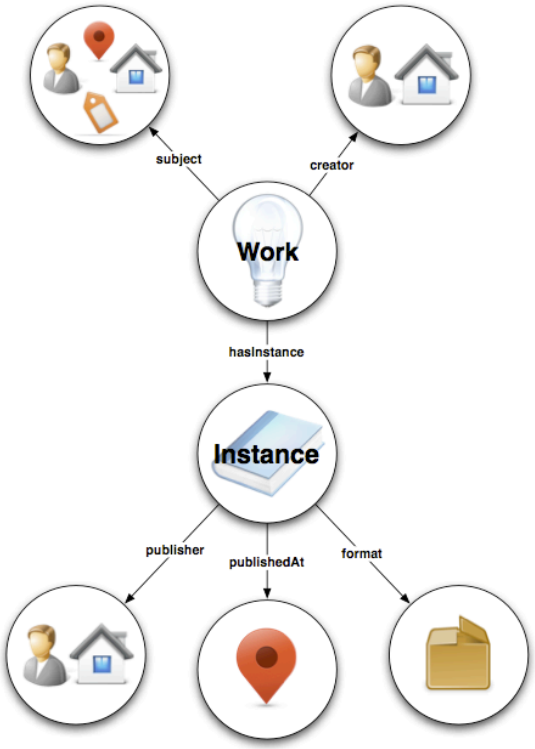
Linked data best practices (partial) from Sanderson report

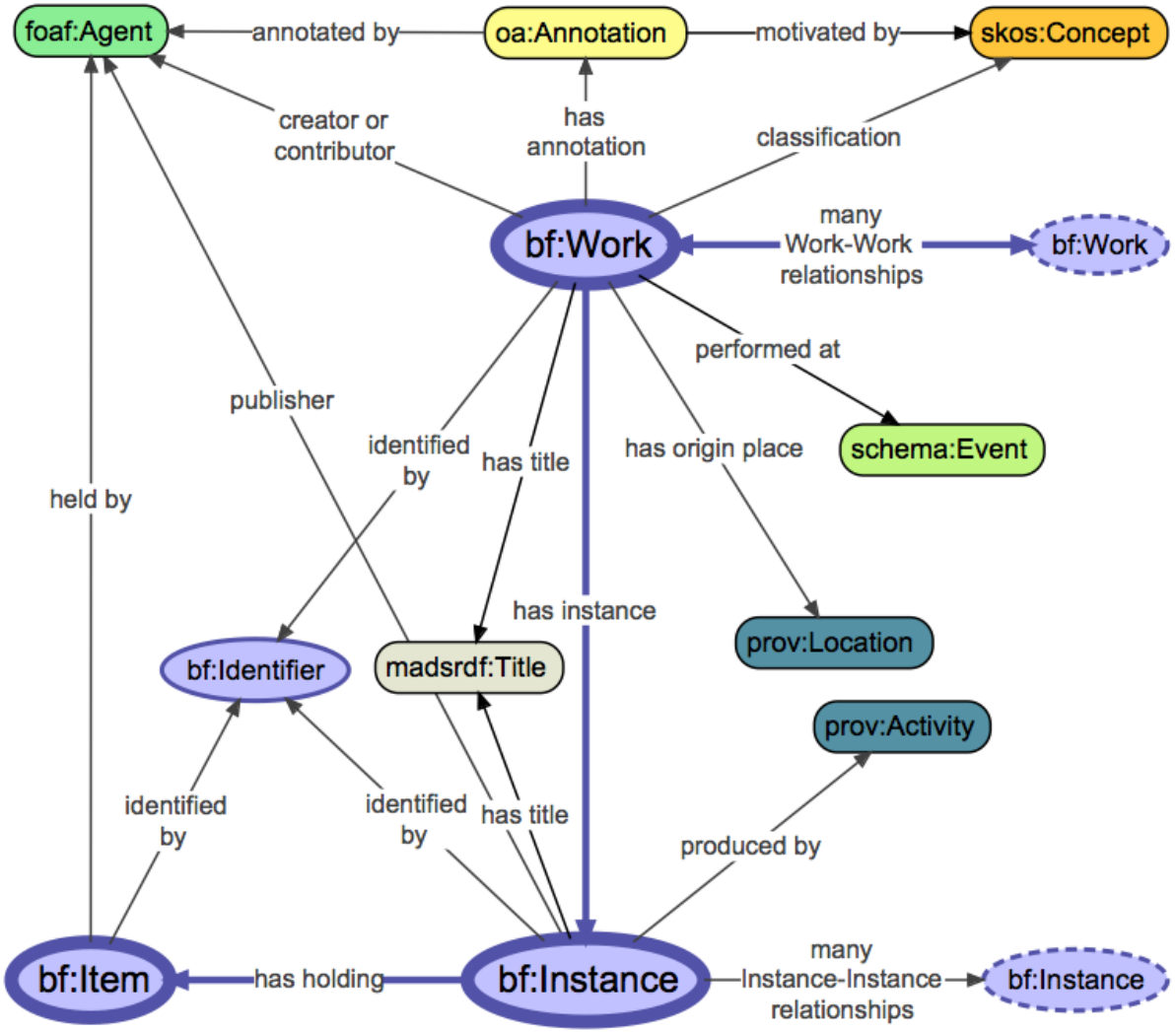
- Clarify and limit scope
- Use URIs in place of strings (identification of the resource itself vs. resource description)
- Avoid use of reification, containers, and blank nodes
- Reuse existing vocabularies and relate new terms to existing ones
- Only define what matters (and inverse relationships do)
- Be consistent in the use of classes vs. predicates vs. instances

Recommendations (partial) from Sanderson report

- Merge predicates where they redundantly express domain and/or range
- Convert identifier subproperties to subclasses
- Remove authorities as entities in favor of real world URIs
- Reuse the Open Annotation ontology vs. reinventing the wheel
- Clarify holdings, titles, serials
- Add a separate class for Item

bibframe.ld4l.org ontology overview





For fully functional linked data

Ideally all library catalog records will (eventually)

- Refer to **identified** works, authors, organizations, places, and subject headings
- Join with VIVO/CAP/Profiles data as a coherent, richer local authority picture
- Interoperate with each other across institutions and with OCLC as linked data
- Interoperate with any other linked data via common global identifiers and shared ontologies

Plans for VIVO

- Linking from Cornell catalog discovery tool to VIVO URIs for researchers and faculty members
  - Similar linkage at Stanford and Harvard
  - Provides richer local context about journal articles, teaching, grants, advising
- Linkage from VIVO back to catalog
  - To authors' own works
  - To theses advised by faculty

Implications for VIVO

- Far more focus on stability and persistence of URIs
- Library advocates for keeping URIs after authors depart or die
  - Archival VIVO raises many policy questions
  - Many technical questions about implementation
- Can become another use case for multi-institutional initiatives in the VIVO community
  - Current task force led by Jing Wang of Johns Hopkins

Opportunities for Vitro

- Broadening user base for fundamental VIVO technologies
  - Ontology editor for those extending BIBFRAME in new domains
  - Content editor for sample data as ontology is developed, to provide real time feedback
- SKOS Vitro to support creation, maintenance, and service delivery for discipline-focused controlled vocabularies
  - Solr and/or SPARQL services

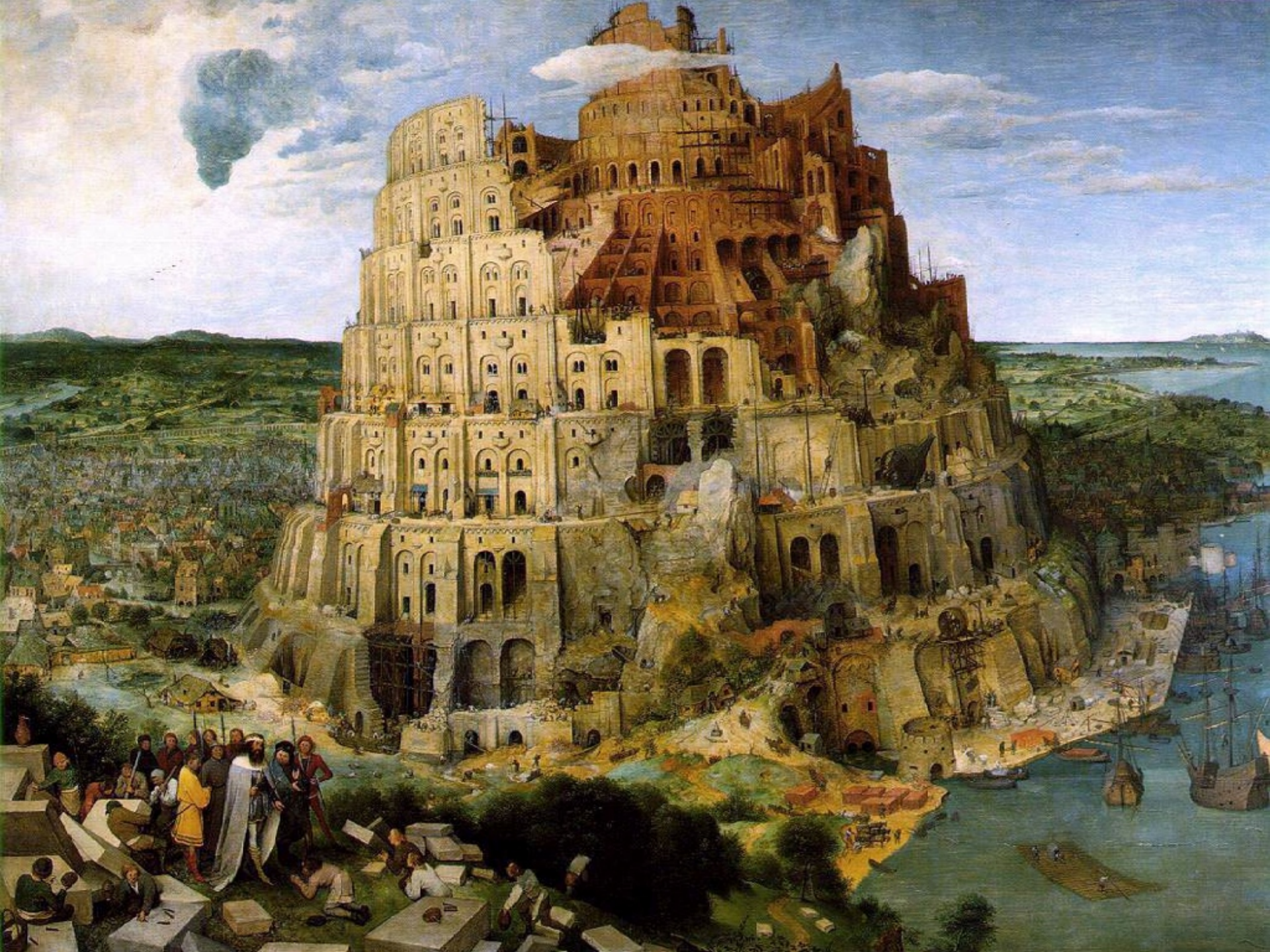
Vitro to manage shared entity URIs

- AgriVIVO use of shared organization list
- Services exposed for consumption in other VIVOs and/or as web services
- Could extend in turn to other lookup services such as ORCID, VIAF, ISNI

Summary

Project timeline August-Dec 2015

- Implement fully functional LD4L instances at Cornell, Harvard, and Stanford
- Public release of open source LD4L code and ontology
- Public release of open source ActiveTriples Hydra Component
- Create public demonstration of LD4L Search-based discovery and access system across the three LD4L instances



Project Outcomes

- Open source extensible LD4L ontology compatible with VIVO ontology, BIBFRAME, and other existing library LOD efforts
- Open source LD4L semantic editing, display, and discovery system
- Project Hydra compatible interface to LD4L, using ActiveTriples to support Blacklight search across multiple LD4L instances

LD4L Team

Questions?

More Info: http://ld4l.org