## What is #LODLAM?! Understanding Linked Open Data in Libraries, Archives [and Museums]

## Alison Hitchens OLA Superconference January 29, 2015 Toronto, ON

Revision of a presentation given at OLITA Digital Odyssey, Ryerson University, June 6,2014

## LINKED [OPEN] DATA AND RESOURCE DESCRIPTION FRAMEWORK (RDF)

# What is linked data?

- method of publishing structured data so that it can be interlinked and become more useful
- builds upon standard Web technologies such as HTTP, RDF and URIs
- rather than using them to serve web pages for human readers, it extends them to share information in a way that can be read automatically by computers

Massaged from Wikipedia linked data page

## Is your information machine-actionable?

## Margaret Atwood

From Wikipedia, the free encyclopedia



This biographical article **needs additional citations for verification**. Please help by adding reliable sources. Contentious material about living persons that is unsourced or poorly sourced **must be removed immediately**, especially if potentially libelous or harmful. (*November 2013*)

Margaret Eleanor Atwood, CC OOnt FRSC (born November 18, 1939) is a Canadian poet, novelist, literary critic, essayist, and environmental activist. She is a winner of the Arthur C. Clarke Award and Prince of Asturias Award for Literature, has been shortlisted for the Booker Prize five times, winning once, and has been a finalist for the Governor General's Award several times, winning twice.<sup>[citation needed]</sup> She is also a founder of the Writers' Trust of Canada, a non-profit literary organization that seeks to encourage Canada's writing community.<sup>[citation needed]</sup>

While she is best known for her work as a novelist, she has also published fifteen books of poetry.<sup>[1][2]</sup> Many of her poems have been inspired by myths and fairy tales, which have been interests of hers from an early age.<sup>[3]</sup> Atwood has published short stories in *Tamarack Review, Alphabet, Harper's, CBC Anthology, Ms., Saturday Night*, and many other magazines. She has also published four collections of stories and three collections of unclassifiable short prose works.

### Margaret Atwood



Atwood at Eden Mills Writers' Festival 2006, Blackwattle Bay

Contents [hide]

## Use structured, machine-actionable data

	🗾 Textual data								
	А	В	С	D	E	F	G	Н	1.00
1	Prices for trip to Holguin on Selloffvacations.com								
2									
1	Regular Service	2-Apr-11	9-Apr-11	1-Apr-16	1-Apr-23	1-Apr-30	7-May-11	14-May-11	21-May-11
4	26-Mar-11	\$1,435.00	\$1,495.00	\$1,575.00	\$1,535.00	\$1,455.00	\$1,398.00	\$1,295.00	\$1,155.00
5	2-Apr-11	\$1,335.00	\$1,535.00	\$1,495.00	\$1,535.00	\$1,468.00	\$1,215.00	\$1,278.00	\$1,068.00
6	9-Apr-11		\$1,285.00	\$1,418.00	\$1,425.00	\$1,515.00	\$1,145.00	\$935.00	\$938.00
7	16-Apr-11			\$1,595.00	\$1,655.00	1625(s)	\$1,275.00	\$1,178.00	\$978.00
8	23-Apr-11				N/A	1545(s)	\$1,305.00	\$1,115.00	\$1,098.00
9	30-Apr-11					NA	\$1,355.00	NA	\$1,055.00
10	7-May-11								
11	14-May 11					C	urrency	/	
12	21-May-11						on eney		
13	28-May-11								
Date									

# Identify your data

- Type of resource: person
- Name: "Margaret Atwood"
- Birth date: 19391118
- Place of birth: Ottawa, Ontario
- Occupation: novelist
- Author of: "The Handmaid's Tale"
- See examples from the <u>DBpedia page for Margaret</u> <u>Atwood</u>

- Margaret Atwood is a person
- Margaret Atwood's name is Margaret Atwood
- Margaret Atwood was born on November 18, 1939
- Margaret Atwood was born in Ottawa, Ontario
- Margaret Atwood's occupation is novelist
- Margaret Atwood wrote "The Handmaid's Tale"

## **Properties in DBpedia**

## About: Margaret Atwood

An Entity of Type : <u>artist</u>, from Named Graph : <u>http://dbpedia.org</u>, within Data Space : <u>dbpedia.org</u>



Margaret Eleanor Atwood, CC OOnt FRSC (born November 18, 1939) is a Canadian poet, novelist, literary critic, essayist, and environmental activist. She is a winner of the Arthur C. Clarke Award and Prince of Asturias Award for Literature, has been shortlisted for the Booker Prize five times, winning once, and has been a finalist for the Governor General's Award several times, winning twice.

Property	Value
dbpedia-owl:abstract	Margaret Eleanor Atwood, CC OOnt FRSC (born November 18, 1939) is a activist. She is a winner of the Arthur C. Clarke Award and Prince of Asturitimes, winning once, and has been a finalist for the Governor General's Aw Writers' Trust of Canada, a non-profit literary organization that seeks to enwork as a novelist, she has also published fifteen books of poetry. Many of been interests of hers from an early age. Atwood has published short storie Saturday Night, and many other magazines. She has also published four c works.
dbpedia-owl:activeYearsEndYear	1953-01-01 (xsd:date)
dbpedia-owl:activeYearsStartYear	1953-01-01 (xsd:date)
dbpedia-owl:almaMater	dbpedia:Victoria_University,_Toronto
dbpedia-owl:birthDate	1939-11-18 (xsd:date)
dbpedia-owl:birthName	<ul> <li>Margaret Eleanor Atwood</li> </ul>
dbpedia-owl:birthPlace	dbpedia:Ottawa

## Smarter browser results



## Margaret Atwood

Poet

Margaret Eleanor Atwood, CC OOnt FRSC is a Canadian poet, novelist, literary critic, essayist, and environmental activist. Wikipedia

Born: November 18, 1939 (age 75), Ottawa

Partner: Graeme Gibson

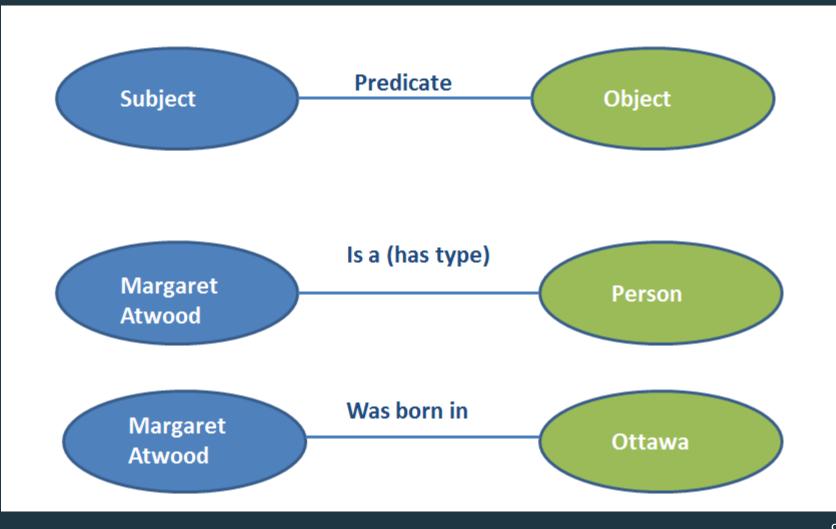
Spouse: Jim Polk (m. 1968–1973)

Awards: Man Booker Prize, Arthur C. Clarke Award, more

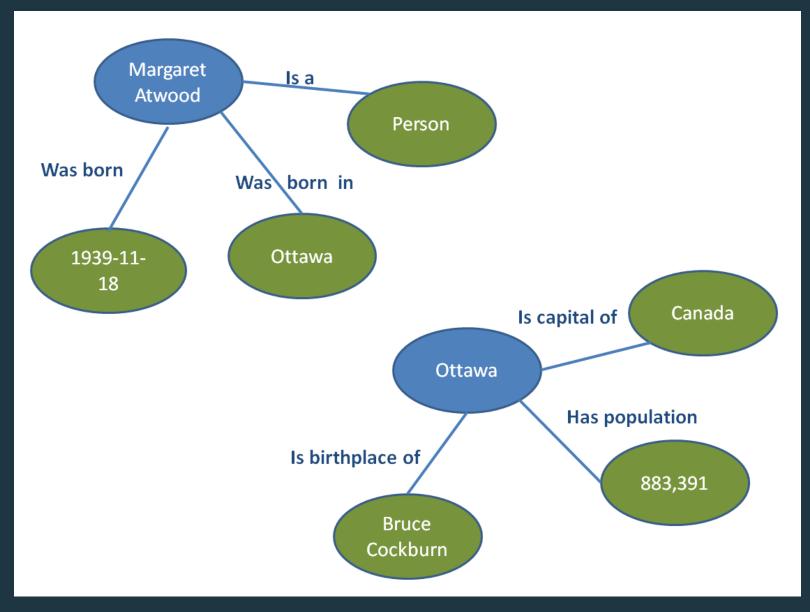
Movies: The Handmaid's Tale, Payback, In the Wake of the Flood, Margaret Atwood: Once in August, The Robber Bride, Yesno

### Image source: Google knowledge graph based on search Margaret Atwood

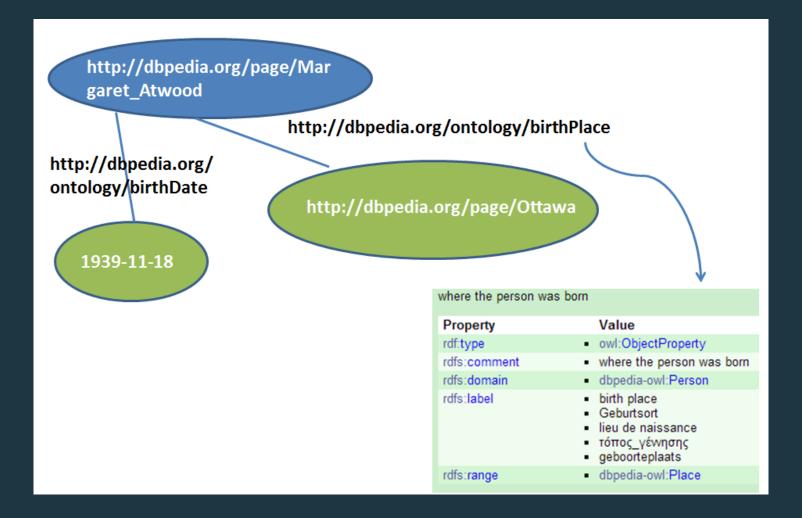
## Structure your data using RDF



## RDF data as a web of data



# Identify everything with a URI



## Re-use vocabularies

- Need to define "person"? <u>Friend of a Friend</u> (FOAF) has already done that!
- Need to define "subject"? The <u>Dublin Core</u> <u>Metadata Initiative (DCMI)</u> has already done that!
- Need to define "genre"? <u>Schema.org</u> has already done that!

## Connect your data

### Ottawa in Dbpedia = http://dbpedia.org/page/Ottawa

owl:sameAs

Ottawa in Freebase = http://rdf.freebase.com/ns/m.05ksh

owl:sameAs

Ottawa in GeoNames= http://sws.geonames.org/6094817/

## Publish data using standard web formats

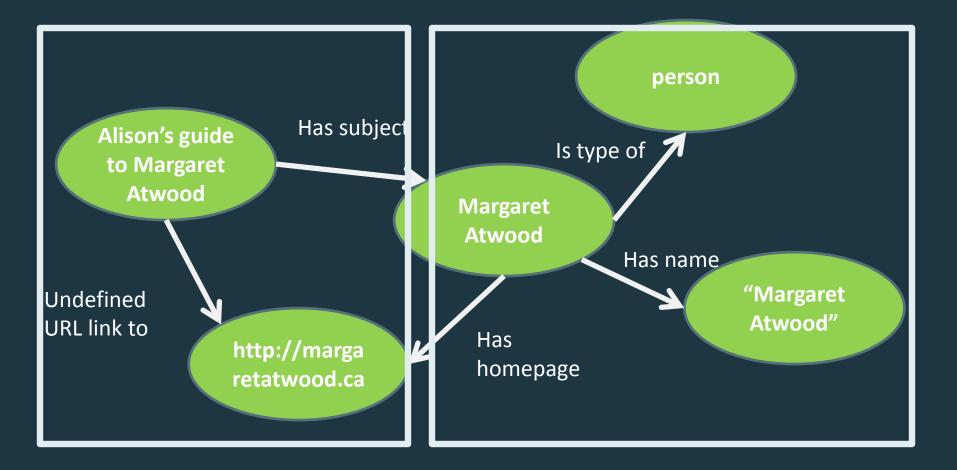
@prefix dbpedia: <http://dbpedia.org/resource/> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix ns16: <http://en.wikipedia.org/wiki/> .

ns16:Margaret\_Atwood foaf:primaryTopic dbpedia:Margaret\_Atwood .

The Wikipedia *page* Margaret Atwood has as its primary topic the DBpedia *resource* Margaret Atwood.

From the DBpedia <u>N3/Turtle file</u>

## The web of things



Inspired by a <u>semantic web slide</u> by Eric Miller

## The Linked Open Data Cloud Diagram

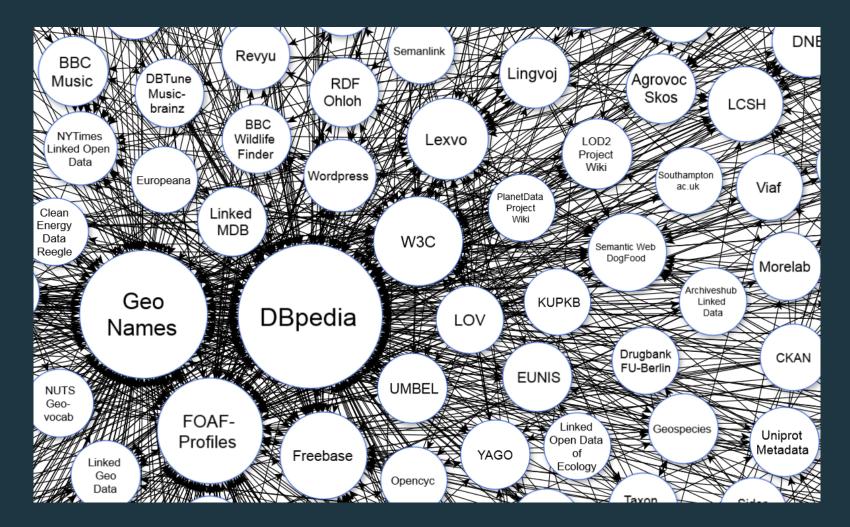
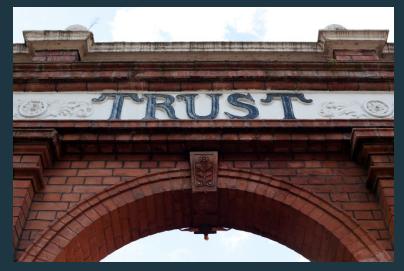


Image taken from: "<u>Linking Open Data cloud diagram 2014</u>, by Max Schmachtenberg, Christian Bizer, Anja Jentzsch and Richard Cyganiak.

# Libraries and archives as consumers of data LINKED OPEN DATA IN LIBRARIES AND ARCHIVES

Libraries and archives as creators of data

# Sharing our data



### **Rachel Figueiredo**

Contact Info Phone number (519) 888-4567 ex. 32648 Send Email

Links: Profile & Guides

### Subjects:

Electrical and Computer Engineering, Civil & Environmental Engineering, Mechanical & Mechatronic Engineering, Management Sciences







# Sharing controlled vocabularies

Transitional	Mandela, Nelson, 1918-2013 🚥 🛏 💿 🚾 🔟 🗐 🖼 📧 📰 🗮 💷 📰 💷 💵 🕿 📟 Mandela, Nelson (Nelson Rolihlahla), 1918- 🐷 Mandela, Nelson 💷 💥 🖾 👺 📡
JUSTICE "	اماندیلا، نیلسون، 1918 🔤 –ماندیلا، نیلسون، 1918 📧 ماندیلا، نیلسون
Volume I General Considerations	מנדלה, נלסון, 1918–2013 🔍 Mandela, Nelson, 1918– 🔛 Mandela, Nelson (South African artist, born 1918, active 2003) 🚟
	VIAF ID: 98029748 (Personal) Permalink: http://viaf.org/viaf/98029748 ISNI-test: <u>0000_0001_2144_7715</u>

- Virtual International Authority File (VIAF)
- <u>Canadian Subject Headings</u>
- <u>Library of Congress</u> vocabularies
- Art and Architecture Thesaurus (AAT)

## Sharing unique resources (via OCLC)

<u>A catalogue of the Lady Aberdeen Library on the History</u> of Women in the University of Waterloo Library

**schema: name** "A catalogue of the Lady Aberdeen Library on the History of Women in the University of Waterloo Library"

schema: creator <u>http://viaf.org/viaf/265365743</u> rdf:type schema: Organization schema:Name "University of Waterloo. Library. Lady Aberdeen Collection"

# Sharing holdings information

## Holdings for "<u>The unofficial Harry Potter</u> <u>cookbook</u>" at Merrimack Valley Library Consortium

### Available copies

### **Current holds**

- 10 copies at Merrimack Valley Library Consortium. (Show)
- 1 copy at Amesbury Public Library.

0 current holds with 12 total copies.

### <meta property= price content= 0.00 >

<span property="sku">j641.59 BUC</span>

k property="availability"

href="http://schema.org/InStock" />Available</>

## Imagine use of our holdings data

## The Handmaid's Tale

Book by Margaret Atwood

\*\*\*\* 4/5 - Goodreads



VINTAGE ATWOOD

The Handmaid's Tale is a dystopian novel, a work of science fiction or speculative fiction, written by Canadian author Margaret Atwood and first published by McClelland and Stewart in 1985. Wikipedia

Published: 1985

Author: Margaret Atwood

Original language: English

Characters: Offred, Serena Joy, Ofglen, Professor Pieixoto, Nick, Moira, Luke

Adaptations: The Handmaid's Tale (1990), The Handmaid's Tale

Genres: Novel, Science Fiction, Feminist science fiction, Dystopia, Speculative fiction, Utopian and dystopian fiction

Inspired by a Karen Coyle <u>blog</u> post 1 copy available from <u>University of Waterloo Library</u>

2 copies available from Laurier Library

1 copy available from Waterloo Public Library

# Replacing MARC



### Image source: Library of Congress. Overview of the BIBFRAME Model http://www.loc.gov/bibframe/docs/model.html

## bf:BIBFRAME

- Creative Work
- Instance
- Authority
- Annotation

# Exploring BIBFRAME with Libhub

"The Libhub Initiative aims to raise the visibility of Libraries on the Web by actively exploring the promise of BIBFRAME and Linked Data."



Libhub logo used with permission. Source: http://www.libhub.org/

# Beyond metadata: sharing our documentary heritage



## The Muninn Project

- millions of records pertaining to the First World War in archives around the world
- extract the written data using massive amount of computing power and turn the resulting information into structured databases

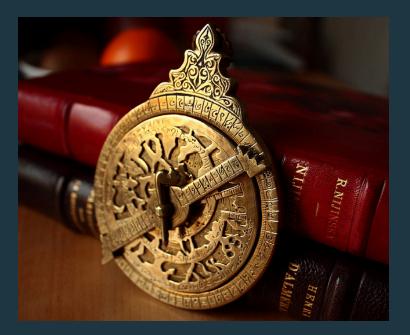
## Making library people visible on the web

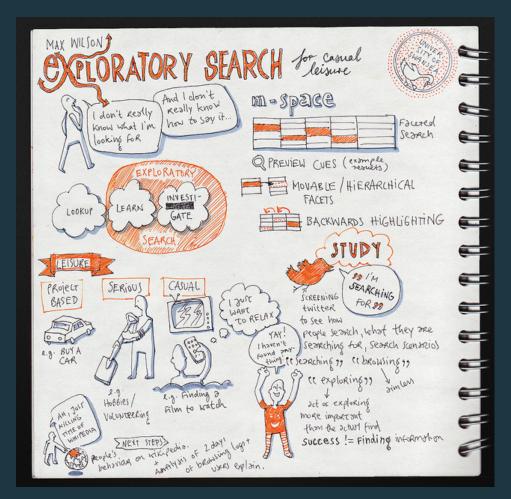
MONTANA STATE UNIVERSITY	LIBRARY				Ask A	Librarian 🗪					
Hom	e Find	Request	Service	s Help	Site Search						
i Scott W. H. Young - People at MSU Library											
	Title Digital I [Assistant Department Computing University Phone 406-9	Scott W. H. Young Title Digital Initiatives Librarian [Assistant Professor] Department Library Informatics and Computing, Montana State University (MSU) Phone 406-994-6429 Email swyoung@montana.edu Room 148		Liaison Role(s) Electrical engineering Computer engineering Expertise and Skill(s)		More Information Graph Visualization Vita Homepage RDF					
				Web develop Digital library Search engine User experier Social media	, e optimization						

### Source: http://www.lib.montana.edu/people/about.php?id=99

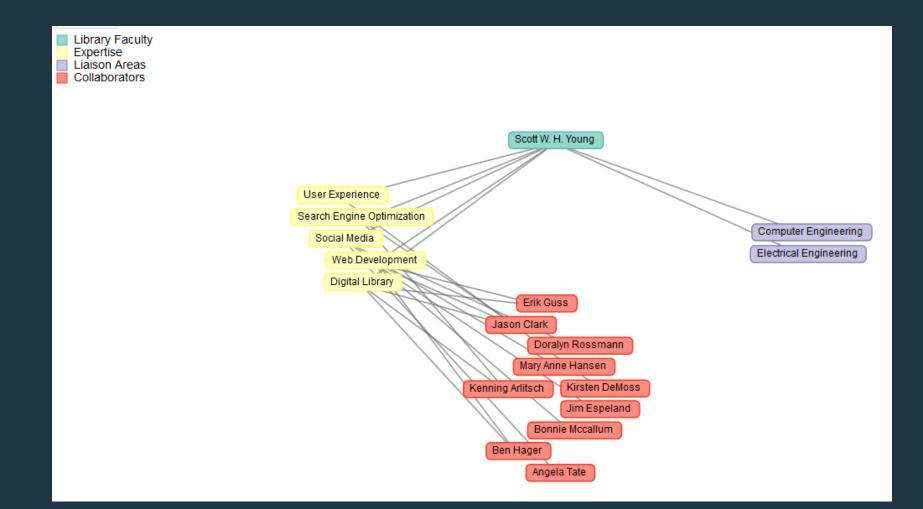
## Consuming data to aid discovery





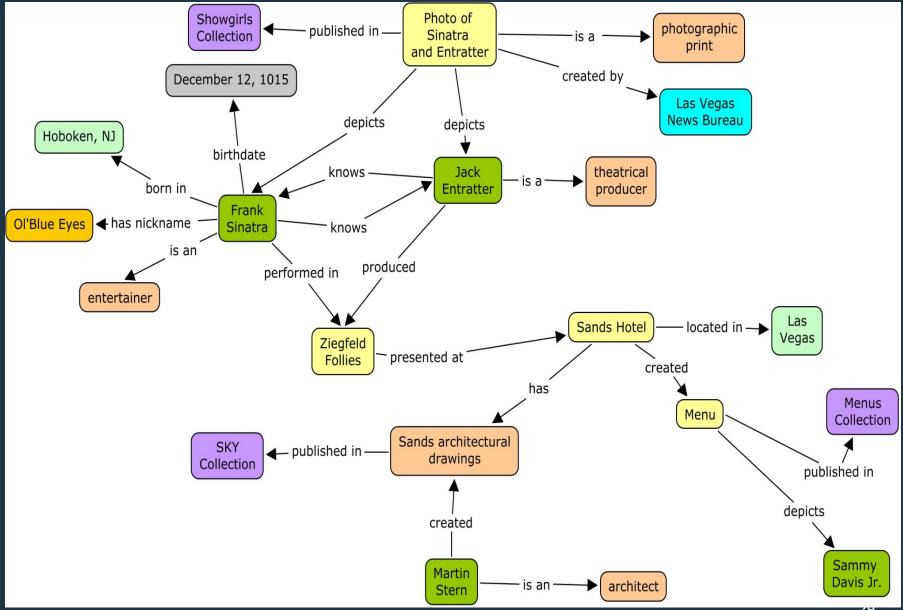


# Visualizing library people



Source: http://www.lib.montana.edu/people/network/graph.php?dataset=99

## Connecting local digital libraries



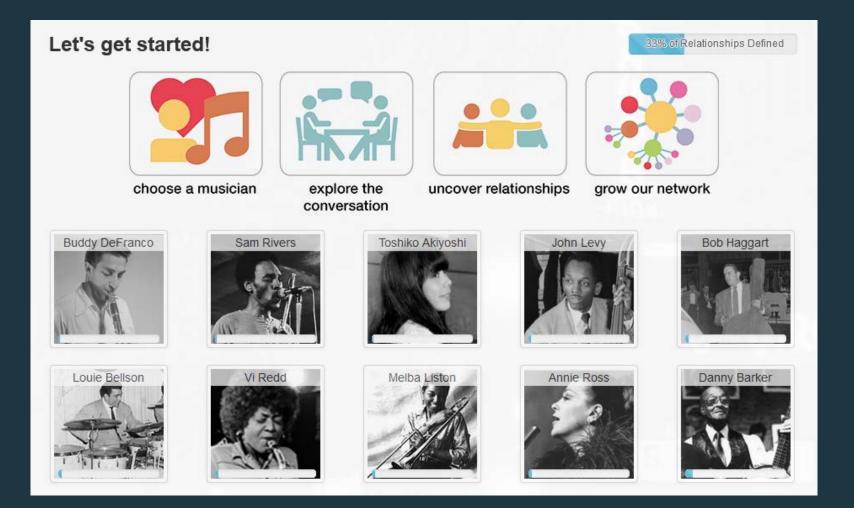
Slide from: Unleashing Expressivity / Cory Lampert. Used with permission.

## **Connecting across libraries & archives**



Source: Pan-Canadian Documentary Heritage Network Linked Open Data Visualization "Proof-of-Concept" Out of the trenches: linked open data of the first world war: final report. Image from p. 11

# **Crowdsourcing Relationships**



## Augment our catalogues



### Involved in:

→ Johann Sebastian Bach's Lebt
 Programm zu dem am 28. Julius 1850 eintre
 Hilgenfeldt, Carl L.. - Leipzig : Hofmeister, 18
 → Als die von I. Hoch-Edlen und Hoch-Weis
 durch etliche Reden eingeweyhet wurde, w
 Bach, Johann Sebastian. - Leipzig : Breitkopf,
 → Prailudien und Fugen/Es-Dur BWV 552. B
 Bach, Johann Sebastian. - 1896
 → Text zur grossen Messe in H moll

Bach, Johann Sebastian (1685-1750). - Berlin.

All Objects (41)

### Involved in:

- → Johann Sebastian Bach's Leben, Wirken und Werke : ein Beitrag zur Kuns Programm zu dem am 28. Julius 1850 eintretenden Säculartage des Todes v Hilgenfeldt, Carl L.. - Leipzig : Hofmeister, 1850
   → Als die von I. Hoch-Edlen und Hoch-Weisen Rathe der Stadt Leipzig neuge arch for
  - durch etliche Reden eingeweyhet wurde, ward folgende Cantata dabey... Bach, Johann Sebastian. - Leipzig : Breitkopf, [ca. 1730]
  - → Präludien und Fugen/Es-Dur BWV 552. Bearb. BSB Mus.coll. 4.323 Bach, Johann Sebastian. - 1896
  - → Text zur grossen Messe in H moll

Bach, Johann Sebastian (1685-1750). - Berlin : 1834

All Objects (41)

### Subject of:

### J. S. Bach

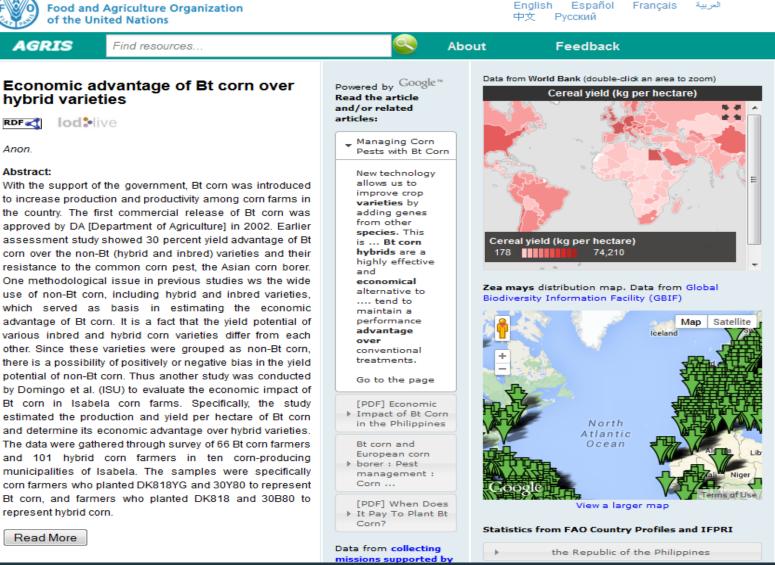
А

Arnold, Denis Midgley. - Göttingen : Vandenhoeck & amp; Ruprecht, 1989

Bach als Ausleger der Bibel : theologische und musikwissenschaftliche St Petzoldt, Martin. - Göttingen : Vandenhoeck & amp; Ruprecht, 1985

```
Subject of:
```

## Mash-up external resources: FAO



33

## Gathering Data for the Catalogue

뿞

Economic advantage of Bt corn over hybrid varieties

RDF d lod live

Anon.

#### Abstract:

With the support of the government, Bt corn was introduced to increase production and productivity among corn farms in the country. The first commercial release of Bt corn was approved by DA [Department of Agriculture] in 2002. Earlier assessment study showed 30 percent yield advantage of Bt corn over the non-Bt (hybrid and inbred) varieties and their resistance to the common corn pest, the Asian corn borer. One methodological issue in previous studies ws the wide use of non-Bt corn, including hybrid and inbred varieties, which served as basis in estimating the economic advantage of Bt corn. It is a fact that the yield potential of various inbred and hybrid corn varieties differ from each other. Since these varieties were grouped as non-Bt corn, there is a possibility of positively or negative bias in the yield potential of non-Bt corn. Thus another study was conducted by Domingo et al. (ISU) to evaluate the economic impact of Bt corn in Isabela corn farms. Specifically, the study estimated the production and yield per hectare of Bt corn and determine its economic advantage over hybrid varieties. The data were gathered through survey of 66 Bt corn farmers and 101 hybrid corn farmers in ten corn-producing municipalities of Isabela. The samples were specifically corn farmers who planted DK818YG and 30Y80 to represent Bt corn, and farmers who planted DK818 and 30B80 to represent hybrid corn.

### Read More

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# Current state of LODLAM

- Developing use cases
- Structuring, cleaning and releasing data
- Developing new frameworks and tools
- Exploration, prototypes and proofs of concept
- Learning!



# Thank you!

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# Image credits for slide 16

## • Trust -

https://www.flickr.com/photos/criminalintent /3661629219 Lars Ploughman, 2009.

## • LCSH-

https://www.flickr.com/photos/codlibrary/228 3643045 C.O.D. Library, 2008

## • Manga -

https://www.flickr.com/photos/klara/4553380 171 Klara, 2010

# Image credits for slide 23

## • Silo canister -

https://www.flickr.com/photos/14617207@N00/ 4872111479 Alan Berning 2010

 Max Wilson: Exploratory Search @ London Enterprise Search Meetup <u>https://www.flickr.com/photos/evalottchen/5232</u> 656622 Eva-Lotta Lamm 2010

 Astrolobe, 18<sup>th</sup> Century -<u>https://www.flickr.com/photos/austinevan/3316</u> <u>195479</u> Evan Bench 2009

## **General Linked Data Resources**

Tim Berners-Lee (2009) The next web. A TED talk, February 2009. access at <a href="http://www.ted.com/talks/tim\_berners\_lee\_on\_the\_next\_web.html">http://www.ted.com/talks/tim\_berners\_lee\_on\_the\_next\_web.html</a> (open access)

Karen Coyle (2012). "Is linked data the answer?" Coyle's Information Thurs. Oct. 18, 2012. <u>http://kcoyle.blogspot.ca/2012/10/is-linked-data-answer.html</u> (open access)

Karen Coyle (2010). Understanding the semantic web: bibliographic data and metadata. Chicago: American Library Association (Library Technology reports ; v. 46, no. 1) <u>http://www.metapress.com.proxy.lib.uwaterloo.ca/content/g212v1783607/</u> (subscription required)

Tom Heath and Christian Bizer (2011) Linked Data: Evolving the Web into a Global Data Space (1st edition). Synthesis Lectures on the Semantic Web: Theory and Technology, 1:1, 1-136. Morgan & Claypool. <u>http://linkeddatabook.com/editions/1.0/</u> (open access)

Linked Data: Connect Distributed Data Across the Web <u>http://linkeddata.org/</u> (open access) (includes the LOD Cloud diagram)

W3C Working Group (2014). RDF 1.1 Primer. <u>http://www.w3.org/TR/rdf11-primer/</u> (open access)

## Some LODLAM Projects

Sean Aery (2014) Schema.org and Google for Local Discovery: Some Key Takeaways. Blog post 2014-03-27 <u>http://blogs.library.duke.edu/bitstreams/2014/03/27/schema-org-and-google-for-local-discovery-some-key-takeaways/</u> (open access)

Jennifer Bowen, Philip E Schreur (2012). Linked Data for Libraries: Why should we care? Where should we start? CNI, April 2-3 2012 Baltimore, Maryland <a href="http://www.cni.org/topics/information-access-retrieval/linked-data-for-libraries/">http://www.cni.org/topics/information-access-retrieval/linked-data-for-libraries/</a> (open access video)

Case Study: King's College London Boosts Access to its Archives with Linked Open Data (2014) <u>http://www.theeuropeanlibrary.org/tel4/newsitem/5700</u> (open access)

Jason Clark and Scott W.H. Young. Linked Data is People: using linked data to reshape the library staff directory. Presented at ACCESS 2014, Calgary, Alberta <u>http://slides.com/swyoung/access-2014-linked-data-is-people/embed?style=light</u> (open access)

James Cuno. Art & Architecture Thesaurus Now Available as Linked Open Data. Blog post 2014/02/14 <u>http://blogs.getty.edu/iris/art-architecture-thesaurus-now-available-as-linked-open-data/</u> (open access)

## Some LODLAM Projects

Food and Agriculture Organization of the United Nations (2014). AGRIS 2.0 <u>http://aims.fao.org/openagris</u> (open access)

Mark Jordan. easyLOD <u>https://github.com/mjordan/easyLOD</u> (open access software)

IGeLU/ELUNA Special Interest Working Group on Linked Open Data http://igelu.org/special-interests/lod (partially open access)

Lukas Koster (2013). "The Poor Person's Linked Open Data Workbench: Using Discovery Tools for Presenting Integrated Information" in Commonplace.net Nov. 11, 2013 <u>http://commonplace.net/2013/11/the-poor-persons-linked-open-</u> <u>data-workbench/</u> (open access)

Ulrike Krabo (2011). Exploiting DBPedia for use in Primo. Presentation at IGeLU 2011 Haifa <u>http://igelu.org/wp-</u> <u>content/uploads/2011/09/igelu11 dbpedia integration in primo-</u> <u>Krabo.pdf</u> (open access)

## Some more LODLAM projects

LiAM: Linked Archival Metadata http://sites.tufts.edu/liam/2013/09/03/what-is-ld/ (open access)

Libhub http://www.libhub.org/ (open access)

Library and Archives Canada (2012). Canadian Subject Headings in SKOS/RDF Format <u>http://www.bac-</u> <u>lac.gc.ca/eng/news/Pages/canadian-subject-headings-skos-rdf-</u> <u>format.aspx</u> (open access)

Library of Congress. Bibliographic Framework Initiative <a href="http://www.loc.gov/bibframe/">http://www.loc.gov/bibframe/</a> (open access)

Library of Congress. LC Linked Data Service: Authorities and Vocabularies <u>http://id.loc.gov/</u> (open access)

## Even more LODLAM projects

Linked Data for Libraries (LD4L) wiki (project of Cornell, Harvard, Stanford) (2014) <u>https://wiki.duraspace.org/pages/viewpage.action?pageId=41354028</u> (open access)

Linked Jazz <u>http://vimeo.com/68308675</u> (open access video)

Meaningful Concept Displays <a href="http://mcd.ischool.drexel.edu/">http://mcd.ischool.drexel.edu/</a> (open access)

Erik T. Mitchell (2013). "Library Linked Data: Research and Adoption. Chicago: American Library Association. (Library Technology Reports v. 49, no. 5) <u>http://www.metapress.com/content/rn608wp1077n/</u> (subscription required)

H.L. Moulaison and S. N. Stanley (2013). "Beyond Failure: Potentially Mitigating Failed Author Searches in the Online Library Catalog Trough the Use of Linked Data" Journal of Web Librarianship (v. 7, no. 1) p. 37-57. <u>http://resolver.scholarsportal.info/resolve/19322909/v07i0001/37\_bfpmfattu</u> <u>old.xml</u> (subscription required)

## Even more LODLAM projects

The Muninn Project <a href="http://blog.muninn-project.org/node/3">http://blog.muninn-project.org/node/3</a> (open access)

Peter Neish (2014). Linked Data: Thinking Big, Starting Small. VALA 2014 Proceedings. http://peter.neish.net/wp-content/uploads/sites/6/2014/02/VALA2014-Session-10-Neish-Paper.pdf (open access)

OCLC (2013). Linked Data at OCLC <u>http://www.oclc.org/data.en.html</u> (open access)

Pan-Canadian Documentary Heritage Network Linked Open Data Visualization "Proof-of-Concept" Out of the trenches: linked open data of the first world war: final report. <u>http://www.canadiana.ca/sites/pub.canadiana.ca/files/PCDHN%20Proof-of-concept Final-Report-ENG 0.pdf</u> (open access)

Stefanie Rűhle, Francesca Schulze & Michael Bűchner. Applying a Linked Data Compliant Model: The Usage of the Europeana Data Model by the Deutsche Digitale Bibliothek. Presented at International Conference on Dublin Core and Metadata Applications DC-2014, Austin, Texas, October 2014

http://dcevents.dublincore.org/IntConf/dc-2014/paper/view/231 (open access)

## And even more LODLAM projects

Dan Scott. schema.org: machine-readable cataloguing for the open web. Presented at SWIB14, Bonn, Germany, December 2014 <u>http://www.scivee.tv/node/63282</u> (open access video)

UNLV's Linked Data Project (2014) <u>http://www.library.unlv.edu/linked-data</u> (open access)

VIAF: Virtual International Authority File <a href="http://viaf.org/">http://viaf.org/</a> (open access)

Richard Wallis (2013). Linked Data Progress with OCLC and Others. At OCLC Linked Data Round Table, IFLA Conference, Aug. 19, 2013, Singapore. <u>http://www.slideshare.net/rjw/linked-data-progress-ifla-2013</u> (open access)

Neil Wilson (2014) The Linked Open British National Bibliography <u>http://data.gov.uk/blog/linked-open-british-national-bibliography</u> blog post 22/04/2014 (open access)