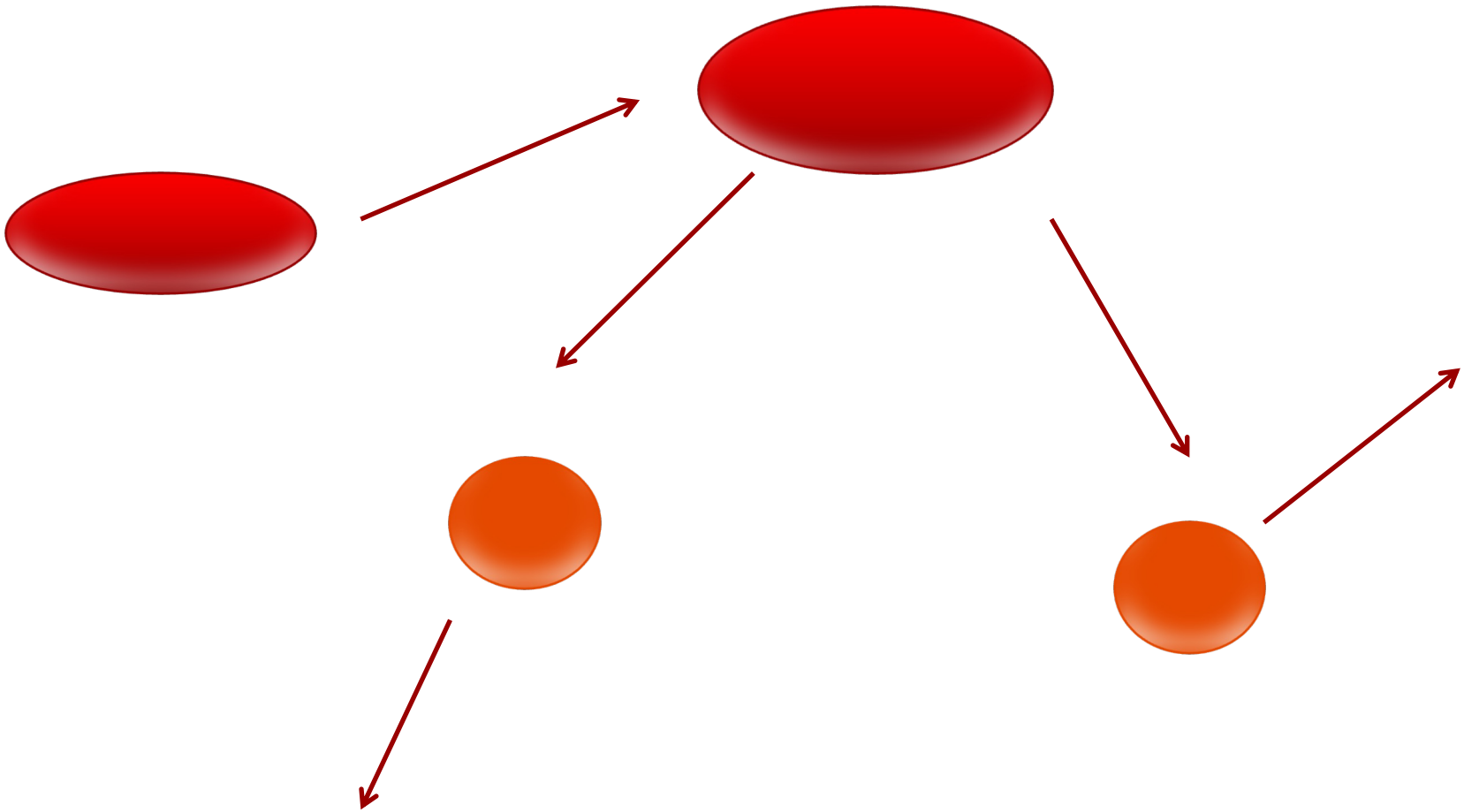
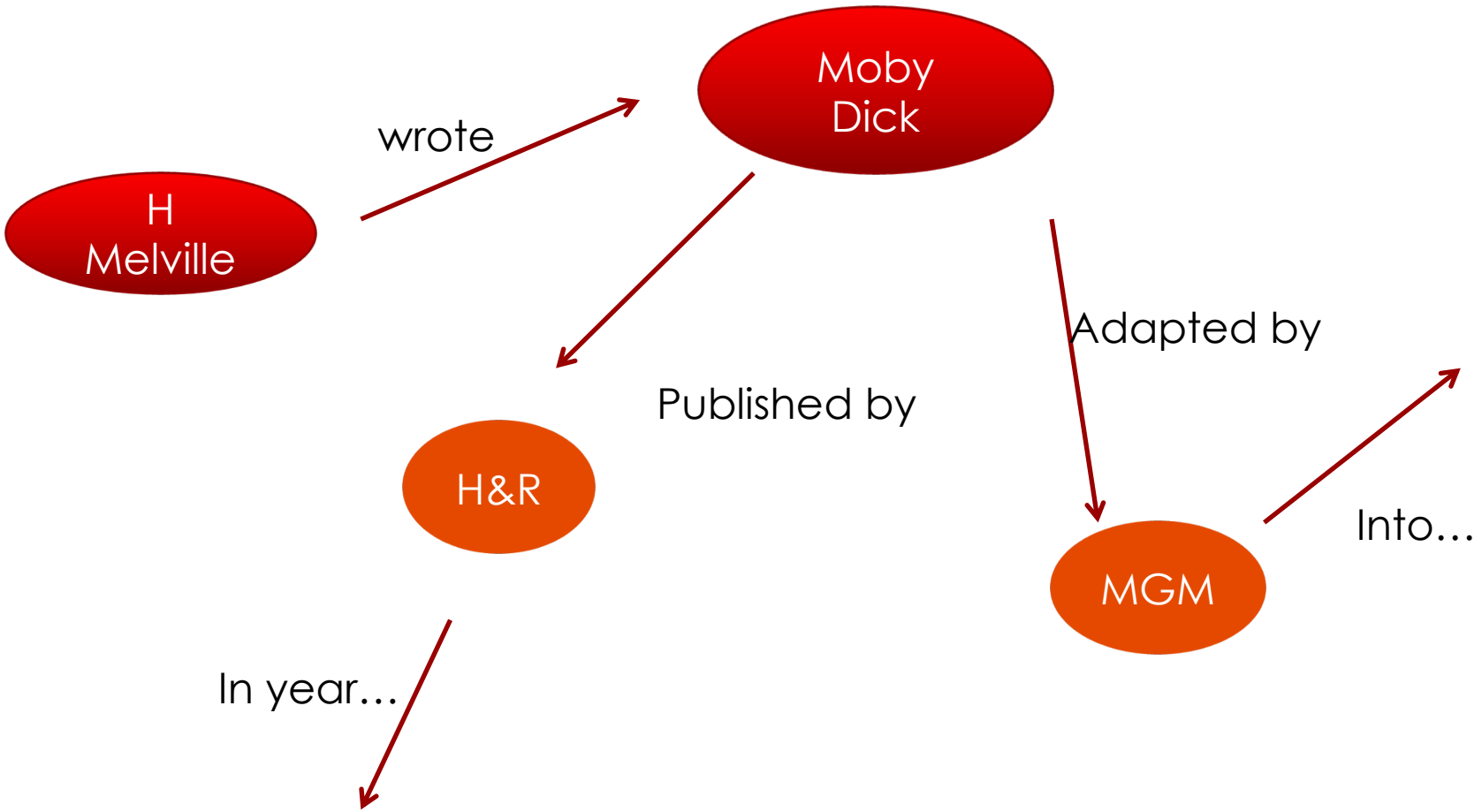
Linked Data

Karen Coyle
kcoyle@kcoyle.net

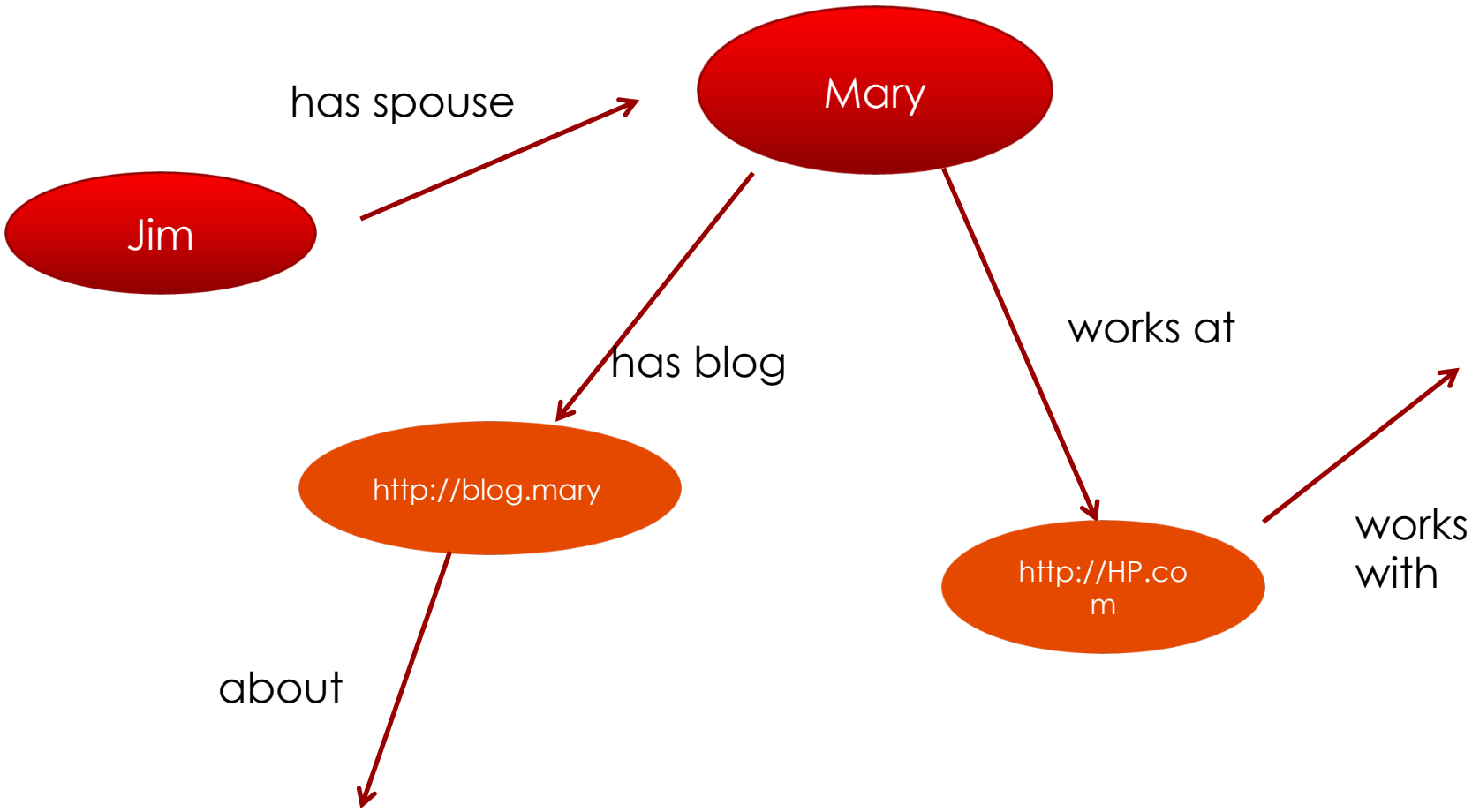
semantic web



semantic web



semantic web



“semantic”

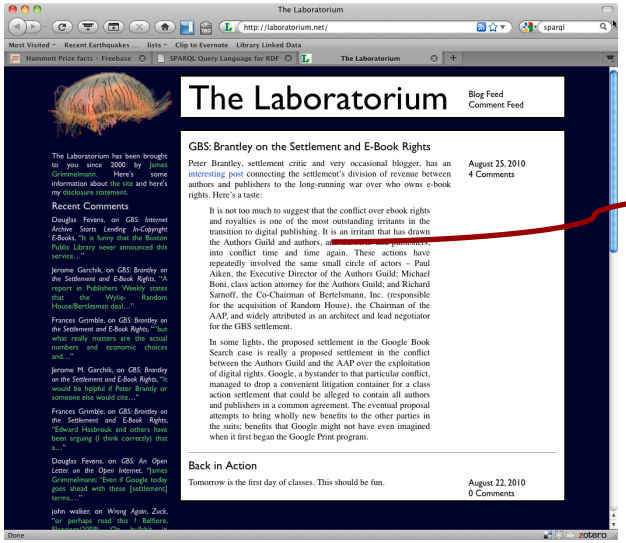
dog =

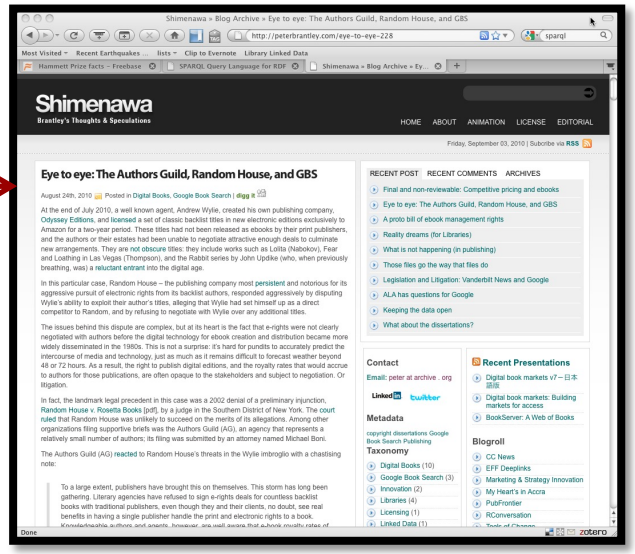
“semantic”

A = B B = C

therefore … A = C

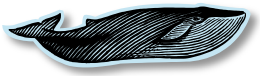
From a web of documents …





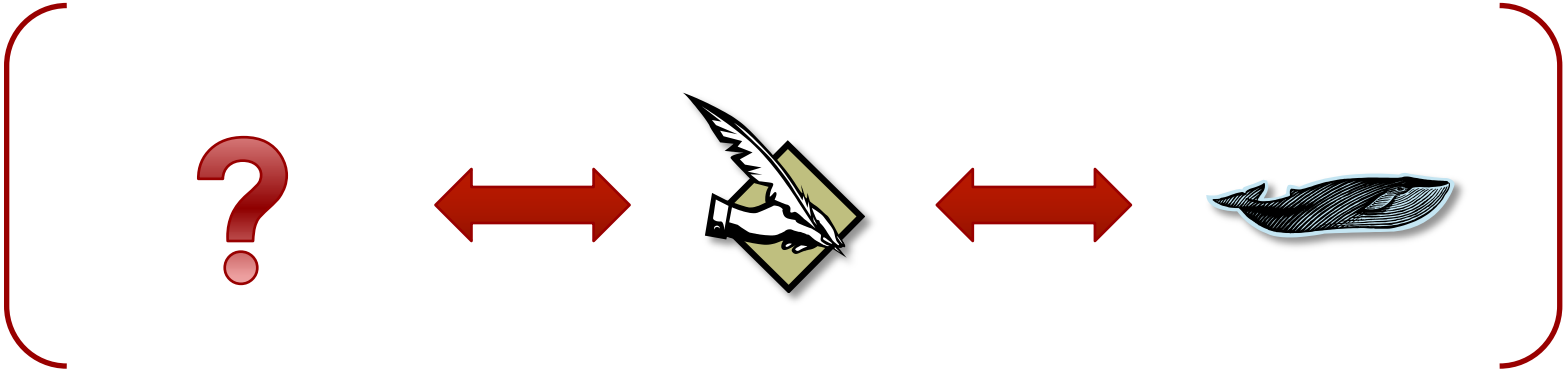
… to a web of data

“triples”



(Herman Melville) (wrote) (Moby Dick)

queries



queries

(Herman Melville)

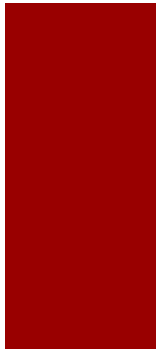
(wrote)

what?

query language

SPARQL

examples from freebase



Freebase – A wealth of free data

http://www.freebase.com/

Most Visited | Recent Earthquakes ... | lists | Clip to Evernote

Freebase – A wealth of free data

Freebase

Sign In Sign Up

A Wealth of Free Data

Film: The Da Vinci Code

Museum: The Louvre

Location: Paris

Person: Audrey Tautou

Location: France

Dog Breed: Poodle

Search 12 million interconnected topics:

Start typing to see suggested matches...

Freebase has facts about:

Fernando Alonso

Bangkok

Seth Mac

Franco Nero

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THE WALL STREET JOURNAL.

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Barbara Cartland

9 July 1901 · 21 May 2000

Last edited by George
January 13, 2010 | History

Edit

Dame Mary Barbara Hamilton Cartland was an English author, known for her numerous romance novels. She also became one of the United Kingdom's most popular media personalities, appearing often at public events and on television, dressed in her trademark pink and discoursing on love, health and social issues. Other than her fictional romance books, she also wrote health and cookery books, and stage plays and recorded an album of love songs. She was often billed as the Queen of Romance. (Source.)

Manage Author Photos

Books by this Author 376 books Add another?

Sorting by: Most Editions | First Published | Most Recent | Title

Love leaves at midnight
8 editions – first published in 1978

Love in the Moon
7 editions – first published in 1980

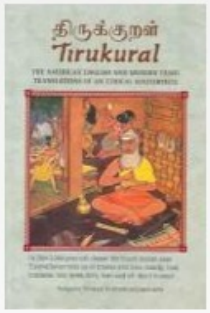
The magic of love
7 editions – first published in 1977

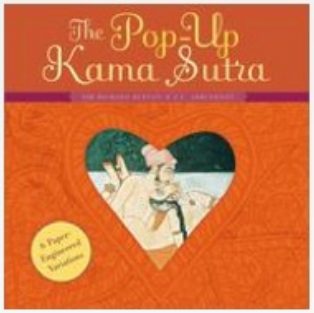
Related...

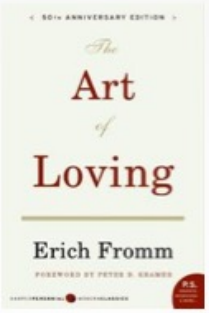
SUBJECTS
Fiction in English, Large type books, History, Biography, Love stories, English, Historical fiction, English, Love, Nobility, Administration of estates, Authorship, Courts and courtiers, Inheritance and succession, Love stories, Man-woman relationships, Napoleonic Wars, 1800-1815, Novelists, English, Orphans, Veterans, Women, Actresses, Aged, Blind, British, Care and hygiene, Child labor

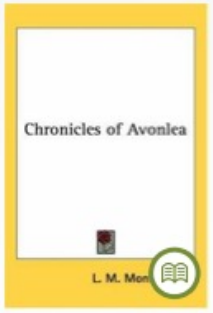
PLACES
England, Great Britain, London (England), Highlands (Scotland), Paris (France), Russia, Scotland, Austria, Bali Island (Indonesia),

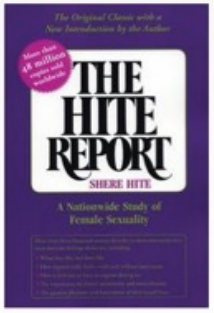
Love 5,129 books published between 1492–2011





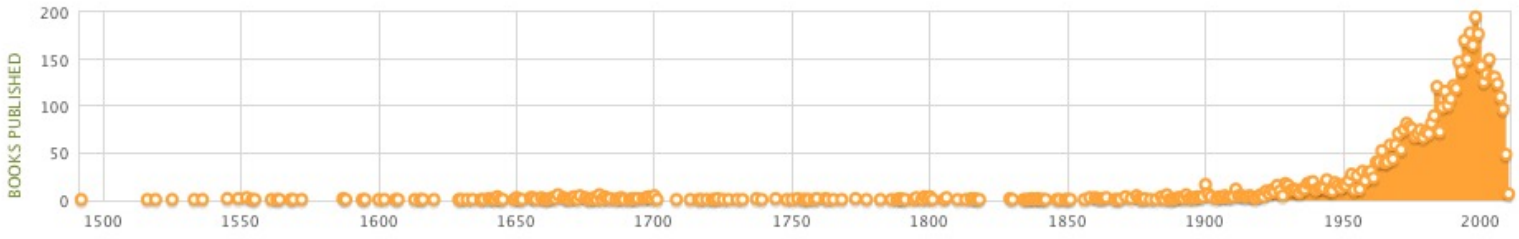






Publishing History

This graph is interactive. Click and drag to select a range, or click a single year and we'll load the books above.



Publishing History

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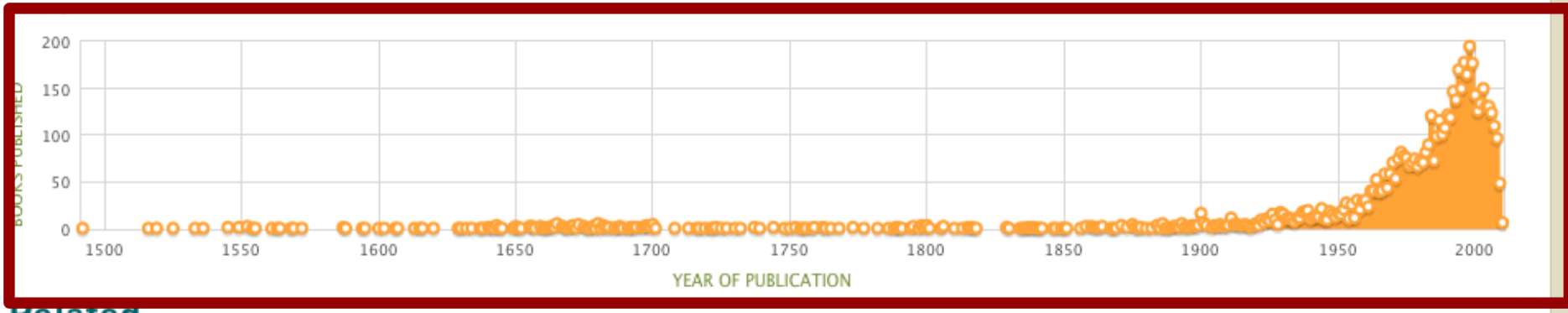


Related...

SUBJECTS

Religious aspects, Christianity, Marriage, Interpersonal relations, God, Man-woman relationships, Sex, History, Miscellanea, Early works to 1800, Women, Intimacy (Psychology), Christian life, Psychological aspects, Spiritual life, Catholic Church, Psychology, Worship and love, Conduct of life, Biblical teaching

PLACES

United States, France, England, India, China, Greece, Japan, Europe, Taiwan, Great Britain, Germany, Spain, New York (N.Y.), Argentina, Italy, Soviet Union, Paris (France), Rome, Canada, London (England)

PEOPLE

Plato, Jesus Christ, Thomas Aquinas, Saint (1225?-1274), Socrates, Augustine Saint, Bishop of Hippo, William Shakespeare (1564-1616), Sigmund Freud (1856-1939), Vātsyāyana, Francis de Sales, Saint (1567-1622), Søren Kierkegaard (1813-1855)

TIMES

20th century, 17th century, 19th century, Middle Ages, 600-1500, To 1500, 18th century, Early church, ca. 30-600, Early works to 1800, 21st century, 16th century

Prolific Authors

who have written the most books on this subject

Ruoquan Wu, 21 books

Plato., 11 books

Gregory J. P. Godek, 11 books

Julian of Norwich, 9 books

Laurie John, 8 books

Francis de Sales, Saint, 7 books

Rougemont, Denis de, 7 books

Emanuel Swedenborg, 7 books

Danru Wu, 7 books

William Shakespeare, 7 books

Prominent Publishers

who have published the most books on this subject

Sine nomine, 57 books

Bantam Books, 53 books

Harper & Row, 38 books

Pocket Books, 33 books

Macmillan, 32 books

Doubleday, 31 books

Paulist Press, 27 books

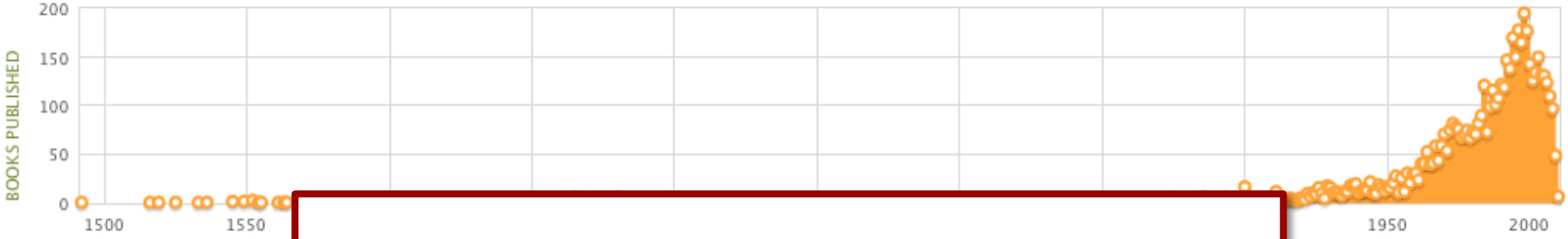
Gallimard, 25 books

Simon & Schuster, 24 books

St. Martin's Press, 24 books

Publishing History

This graph is interactive. Click and drag to select a range, or click a single year and we'll load the books above.



Related...

SUBJECTS

Religious aspects, Christianit
Marriage, Interpersonal relati
God, Man-woman relationshi
Sex, History, Miscellanea, Ear
works to 1800, Women, Intim
(Psychology), Christian life,
Psychological aspects, Spiritu
Catholic Church, Psychology,
Worship and love, Conduct o
Biblical teaching

PEOPLE

Jesus Christ, Plato, Thomas Aquinas, Saint (1225?-1274), Augustine Saint, Bishop of Hippo, Socrates, Sigmund Freud (1856-1939), William Shakespeare (1564-1616), Vātsyāyana, León Hebreo (b. ca. 1460), Søren Kierkegaard (1813-1855)

tury, 17th century, 19th
Middle Ages, 600-1500, To
8th century, Early church, ca.
Early works to 1800, 21st
16th century

Prolific Authors

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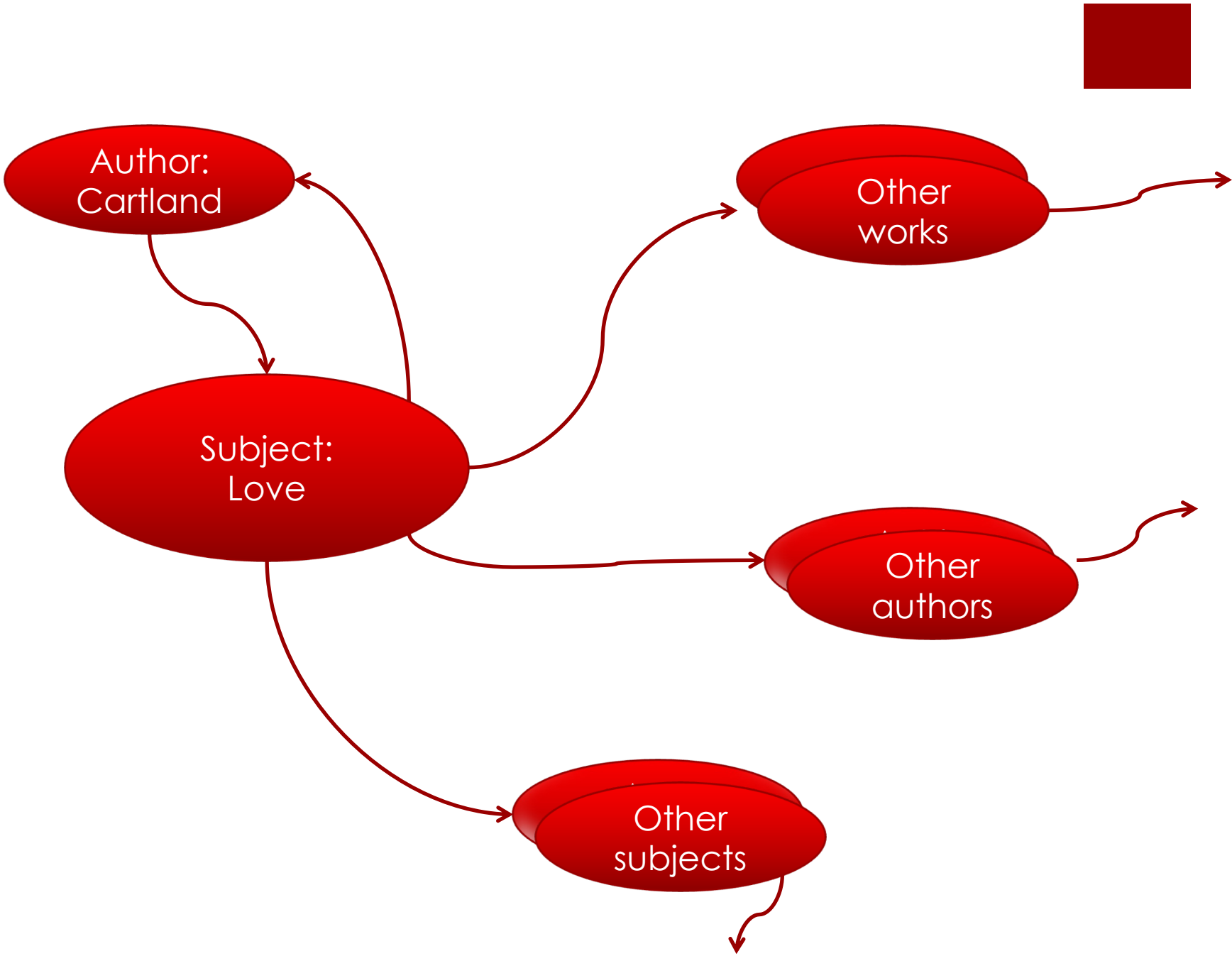
Francis de Sales, Saint, 7 books
Rougemont, Denis de, 7 books
Emanuel Swedenborg, 7 books
Danru Wu, 7 books
William Shakespeare, 7 books

Pocket Books, 33 books
Macmillan, 32 books
Doubleday, 31 books
Paulist Press, 27 books
Gallimard, 25 books
Simon & Schuster, 24 books
St. Martin's Press, 24 books


Author:
Cartland
Other
works
Subject:
Love
Other
authors
Other
subjects

To Do:

1. More data, less text
2. Metadata that is “web-friendly”
3. Metadata that can be used and re-used by anyone (APIs, mash-ups, open access)

More data, less text

DATA

nationalatlas.gov
Where We Are

PENNSYLVANIA

POPULATED PLACES

- 1,000,000 and over ● Philadelphia
- 100,000 – 499,999 • Pittsburgh
- 25,000 – 99,999 • Easton
- 24,999 and less · Somerset
- State capital ★ Harrisburg
- Urban areas

TRANSPORTATION

- Interstate; limited access highway
- Other principal highway
- Railroad

PHYSICAL FEATURES

- Streams
- Lakes
- Highest elevation in state (feet) +3213

The lowest elevation in Pennsylvania is sea level (Delaware River).

MILES
0 10 20 30 40 50 60
Albers equal area projection

CANADA
NEW YORK
OHIO
WEST VIRGINIA
MARYLAND
DE
VA
NEW JERSEY
Lake Erie
Ohio River
Allegheny River
Allegheny Res
West Branch Susquehanna River
Susquehanna River
Delaware River
Raystown Lake
Chesapeake Bay
Delaware Bay
APPALACHIAN MTS
Mt Davis +3213
Erie
Edinboro
Corry
Warren
Bradford
Sayre
Coudersport
Mansfield
Towanda
Meadville
Titusville
Kane
Wellsboro
Honesdale
Carbondale
Scranton
Pittston
Wilkes-Barre
Greenville
Oil City
Franklin
Emporium
St Marys
Sharon
Clarion
Williamsport
Jersey Shore
Lock Haven
Grove City
Du Bois
Berwick
Bloomsburg
Hazleton
Stroudsburg
New Castle
Clearfield
Butler
Punxsutawney
Bellefonte
Kittanning
Beaver Falls
State College
Sunbury
Shenandoah
Easton
Aliquippa
Indiana
Tyrone
Pottsville
Allentown
Bethlehem
New Kensington
Lewistown
Altoona
Pittsburgh
Mt Lebanon
Bethel Park
Monroeville
Huntingdon
Lebanon
Reading
Doylestown
Greensburg
Johnstown
Harrisburg
Pottstown
Washington
Carlisle
Norristown
Levittown
Connellsville
Somerset
Bedford
Columbia
Lancaster
Philadelphia
Chambersburg
West Chester
York
Waynesburg
Uniontown
Gettysburg
Chester
Hanover

U.S. Department of the Interior
U.S. Geological Survey

The National Atlas of the United States of America®

Dunkirk
Erie
Jamestown
Olean
Warren
Bradford
Kane
Allegheny National Forest
St Marys
Oil City
Ridgway
Sproul State Forest
Williamsport
Lock Haven
Dubois
Clearfield
Youngstown
New Castle
Butler
Punxsutawney
Pennsylvania
Bloomsburg
Sunbury
Shamokin
Pottsville
Hazleton
Nanticoke
Wilkes-Barre
Back Mountain
Scranton
Elmira
Endicott
Binghamton
Ithaca
Oneonta
Bethlehem
Allentown
Wayne
Clifton
Plainfield
Edison
Penn Hills
Indiana
Altoona
Pittsburgh
Monroeville
Bethel Park
McKeesport
Johnstown
Lebanon
Reading
Harrisburg
Norristown
Trenton
Somerset
Lancaster
Philadelphia
York
Toms River
Cumberland
Hagerstown
Wilmington
Newark
Morgantown
New Jersey
Maryland
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6

Lansing
Cortland
Norwich
Albany
Dunkirk
Ithaca
Oneonta
Erie
Elmira
Endicott
Binghamton
Jamestown
Olean
Warren
Bradford
Kane
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Northfield
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Clarksburg
Columbia
Baltimore
Ocean City
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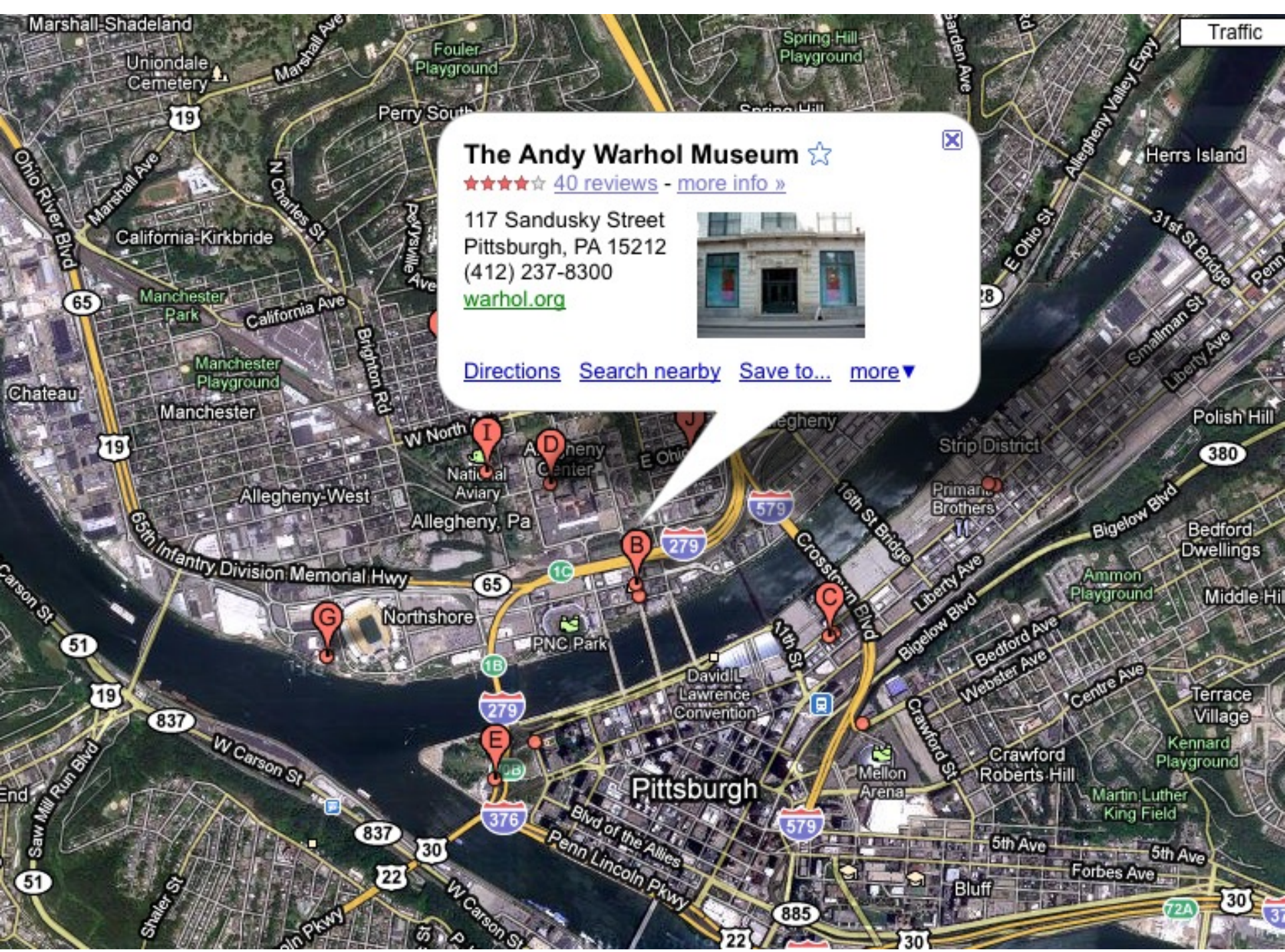
Traffic
The Andy Warhol Museum
40 reviews - more info »
117 Sandusky Street
Pittsburgh, PA 15212
(412) 237-8300
warhol.org
Directions
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Save to...
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Marshall-Shadeland
Uniondale Cemetery
Fouler Playground
Spring Hill Playground
Perry South
Herrs Island
California-Kirkbride
Manchester Park
California Ave
Manchester Playground
Chateau
Manchester
Allegheny-West
Allegheny, Pa
National Aviary
Strip District
Polish Hill
Bedford Dwellings
Ammon Playground
Middle Hill
Northshore
PNC Park
David L Lawrence Convention
Pittsburgh
Mellon Arena
Crawford Roberts Hill
Terrace Village
Kennard Playground
Martin Luther King Field
Bluff
65th Infantry Division Memorial Hwy
Ohio River Blvd
Marshall Ave
N Charles St
Brighton Rd
W North
E Ohio St
Allegheny Valley Expy
31st St Bridge
Smallman St
Liberty Ave
Bigelow Blvd
16th St Bridge
Crosstown Blvd
11th St
Bedford Ave
Webster Ave
Centre Ave
Crawford St
5th Ave
Forbes Ave
W Carson St
Carson St
Saw Mill Run Blvd
Shaler St
Blvd of the Allies
Penn Lincoln Pkwy
Pittsburgh
Bigelow Blvd
Liberty Ave
Crawford St
Penn Lincoln Pkwy
I
D
B
C
G
E

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<tag k="place" v="city"/>
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Publishing History

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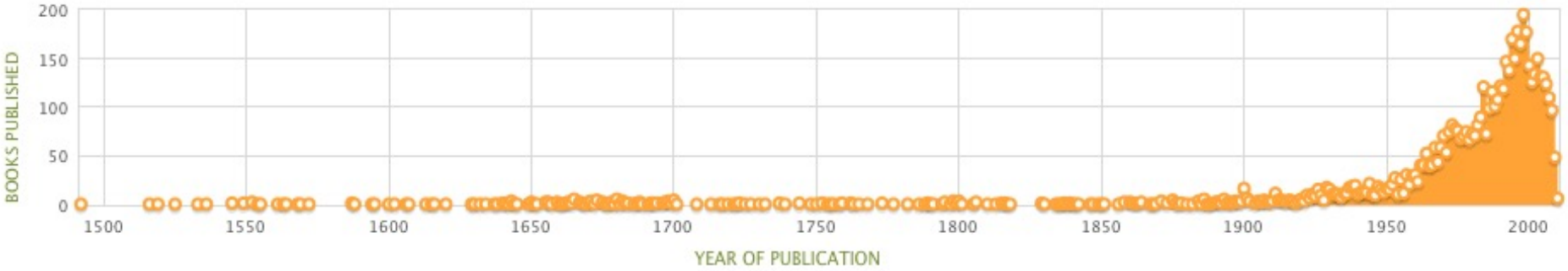

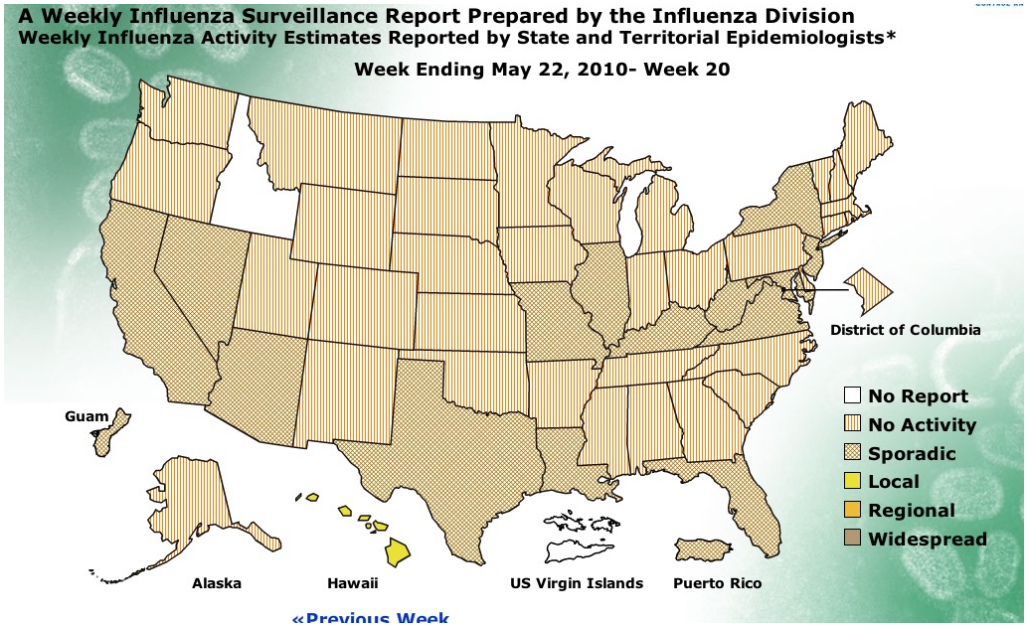

Web-friendly

How do we do that?

- Define data elements in an actionable way
- Define controlled lists in an actionable way
- Assign identifiers that will be unique on the web
- Create the data using these elements and lists

Dublin Core Metadata Terms

Term Name: creator	
URI:	http://purl.org/dc/terms/creator
Label:	Creator
Definition:	An entity primarily responsible for making the resource.
Comment:	Examples of a Creator include a person, an organization, or a service. Typically, the name of a Creator should be used to indicate the entity.
Type of Term:	Property
Refines:	http://purl.org/dc/elements/1.1/creator
Refines:	http://purl.org/dc/terms/contributor
Has Range:	http://purl.org/dc/terms/Agent
Version:	http://dublincore.org/usage/terms/history/#creatorT-001

Dublin Core Metadata Terms

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- <rdf:Description rdf:about="http://purl.org/dc/terms/creator">
    <rdfs:label xml:lang="en-US">Creator</rdfs:label>
  - <rdfs:comment xml:lang="en-US">
      An entity primarily responsible for making the resource.
    </rdfs:comment>
  - <dcterms:description xml:lang="en-US">
      Examples of a Creator include a person, an organization, or a service. Typically, the name of a Creator should be
      used to indicate the entity.
    </dcterms:description>
    <rdfs:isDefinedBy rdf:resource="http://purl.org/dc/terms/"/>
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    <dcterms:modified>2008-01-14</dcterms:modified>
    <rdf:type rdf:resource="http://www.w3.org/1999/02/22-rdf-syntax-ns#Property"/>
    <dcterms:hasVersion rdf:resource="http://dublincore.org/usage/terms/history/#creatorT-001"/>
    <rdfs:range rdf:resource="http://purl.org/dc/terms/Agent"/>
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    <rdfs:subPropertyOf rdf:resource="http://purl.org/dc/terms/contributor"/>
</rdf:Description>
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Controlled lists in SKOS

Authorities & Vocabularies

Return

Search

Enter search terms... GO

Details | Visualize

Working dogs

URI: <http://id.loc.gov/authorities/sh85148177#concept>

Type: Topical Term

Broader Terms:

- Dogs
- Working animals

Narrower Terms:

- Detector dogs
- Dogs on television
- Firehouse dogs
- Guide dogs
- Hearing ear dogs
- Herding dogs
- Hunting dogs
- Livestock protection dogs
- Police dogs
- Rescue dogs
- Schutzhund dogs
- Search dogs
- Service dogs
- Sled dogs
- Watchdogs

```
- <rdf:RDF>
  - <rdf:Description rdf:about="http://id.loc.gov/authorities/sh85038796#concept">
      <skos:prefLabel xml:lang="en">Dogs</skos:prefLabel>
    </rdf:Description>
  - <rdf:Description rdf:about="http://id.loc.gov/authorities/sh85104226#concept">
      <skos:prefLabel xml:lang="en">Police dogs</skos:prefLabel>
    </rdf:Description>
  - <rdf:Description rdf:about="http://id.loc.gov/authorities/sh85063136#concept">
      <skos:prefLabel xml:lang="en">Hunting dogs</skos:prefLabel>
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  - <rdf:Description rdf:about="http://id.loc.gov/authorities/sh85148173#concept">
      <skos:prefLabel xml:lang="en">Working animals</skos:prefLabel>
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  - <rdf:Description rdf:about="http://id.loc.gov/authorities/sh90002095#concept">
      <skos:prefLabel xml:lang="en">Schutzhund dogs</skos:prefLabel>
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  - <rdf:Description rdf:about="http://id.loc.gov/authorities/sh93007695#concept">
      <skos:prefLabel xml:lang="en">Herding dogs</skos:prefLabel>
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  - <rdf:Description rdf:about="http://id.loc.gov/authorities/sh85123395#concept">
      <skos:prefLabel xml:lang="en">Sled dogs</skos:prefLabel>
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  - <rdf:Description rdf:about="http://id.loc.gov/authorities/sh90002554#concept">
      <skos:prefLabel xml:lang="en">Livestock protection dogs</skos:prefLabel>
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  - <rdf:Description rdf:about="http://id.loc.gov/authorities/sh85057714#concept">
      <skos:prefLabel xml:lang="en">Guide dogs</skos:prefLabel>
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  - <rdf:Description rdf:about="http://id.loc.gov/authorities/sh2004000495#concept">
      <skos:prefLabel xml:lang="en">Firehouse dogs</skos:prefLabel>
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  - <rdf:Description rdf:about="http://id.loc.gov/authorities/sh88003151#concept">
      <skos:prefLabel xml:lang="en">Service dogs</skos:prefLabel>
    </rdf:Description>
  - <rdf:Description rdf:about="http://id.loc.gov/authorities/sh85113018#concept">
      <skos:prefLabel xml:lang="en">Rescue dogs</skos:prefLabel>
    </rdf:Description>
```
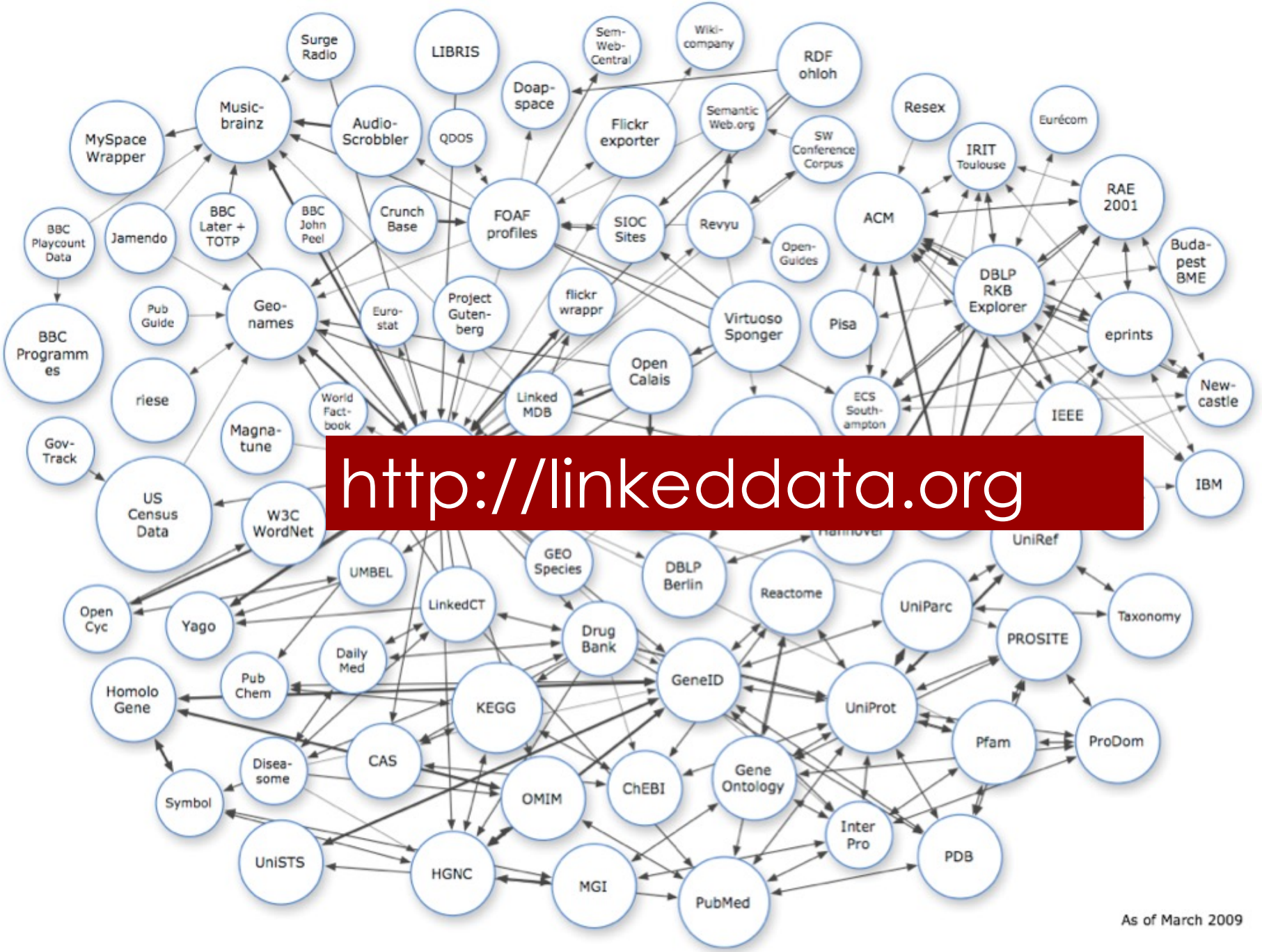

Identifiers

Term Name: title	
URI:	http://purl.org/dc/terms/title
Label:	Title
Definition:	A name given to the resource.

http://kcoyle.net/title

Usable/Reusable


http://linkeddata.org
Surge Radio
LIBRIS
Sem-Web-Central
Wiki-company
RDF ohloh
Doap-space
Music-brainz
Audio-Scrobbler
QDOS
Flickr exporter
Semantic Web.org
SW Conference Corpus
Resex
Eurécom
IRIT Toulouse
MySpace Wrapper
BBC Playcount Data
Jamendo
BBC Later + TOTP
BBC John Peel
Crunch Base
FOAF profiles
SIOC Sites
Revyu
Open-Guides
ACM
RAE 2001
Buda-pest BME
DBLP RKB Explorer
Pub Guide
Geo-names
Euro-stat
Project Guten-berg
flickr wrappr
Virtuoso Sponger
Pisa
eprints
BBC Programmes
riese
Open Calais
World Fact-book
Linked MDB
ECS South-ampton
IEEE
New-castle
Gov-Track
Magna-tune
IBM
US Census Data
W3C WordNet
UMBEL
GEO Species
DBLP Berlin
Reactome
UniRef
UniParc
Taxonomy
Open Cyc
Yago
LinkedCT
Drug Bank
PROSITE
Daily Med
Pub Chem
GeneID
Homolo Gene
KEGG
UniProt
Pfam
ProDom
Disea-some
CAS
Symbol
OMIM
ChEBI
Gene Ontology
Inter Pro
PDB
UniSTS
HGNC
MGI
PubMed
As of March 2009

Thank You!

kcoyle@kcoyle.net

http://kcoyle.net