Discovering Connections

Subject Maps for Browsing Aggregated Collections

John Mark Ockerbloom

Digital Library Federation Spring Forum

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(and some aggregated counter-voices)

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Conclusions (already?)

- **Subject browsing is an important mechanism for resource discovery across aggregated collections**
- **Detailed ontologies like Library of Congress Subject Headings can form the basis for useful browsing, if used with appropriate tools**
- **Subject maps are useful and practical tools for exploring collections with complex ontologies, maintaining those ontologies**

- **Subject maps build on library strengths to better connect our users with the resources they need in a distributed, digitized information environment**

The appeal of browsing

Green Apple Books (San Francisco), March 2007
Photo by Dolan Halbrook (Copyright 2007. Creative Commons Licensed)

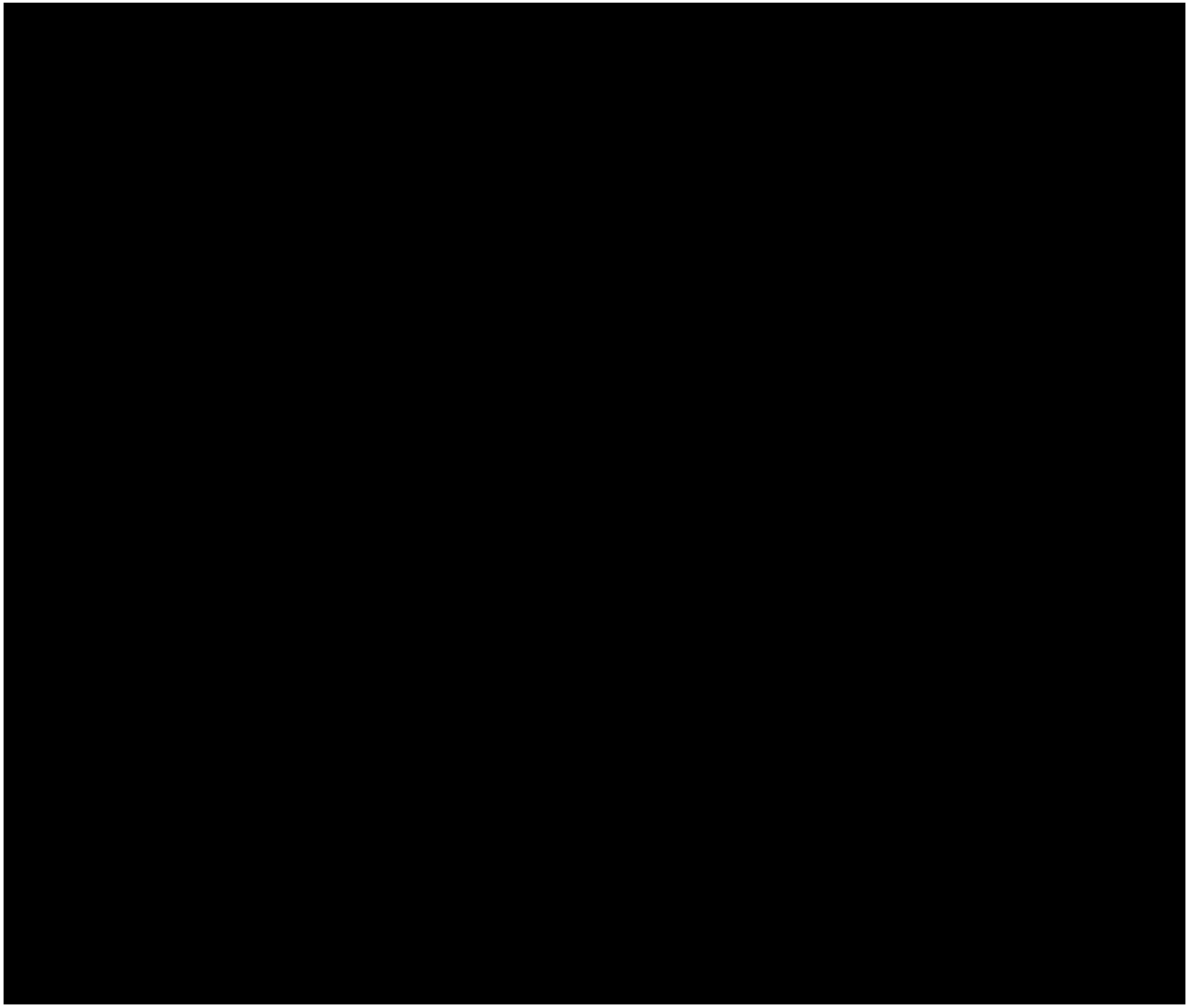
More content not on shelves…

…and hard to browse

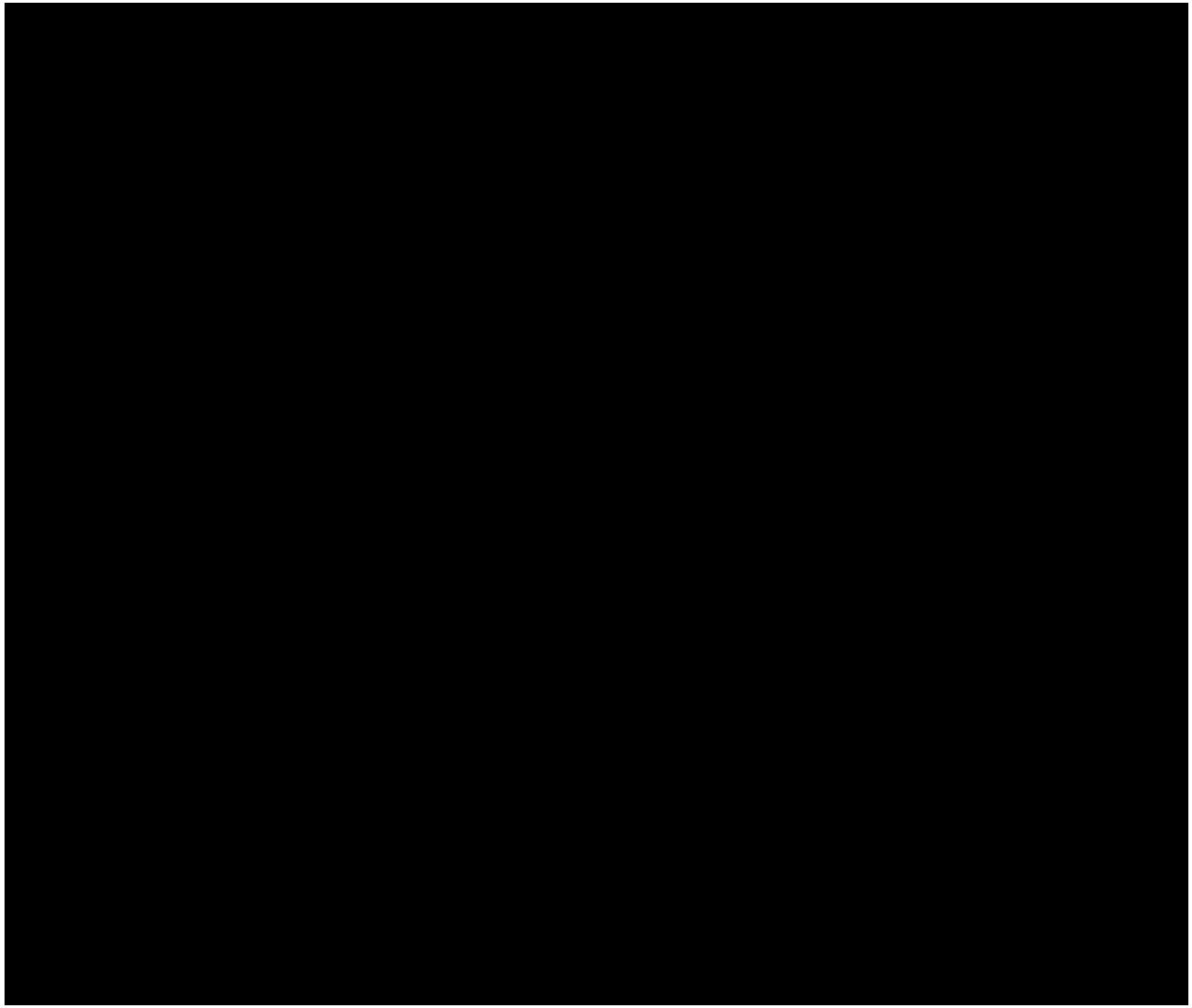
Women in Google Books

In Amazon

In academic tag-space



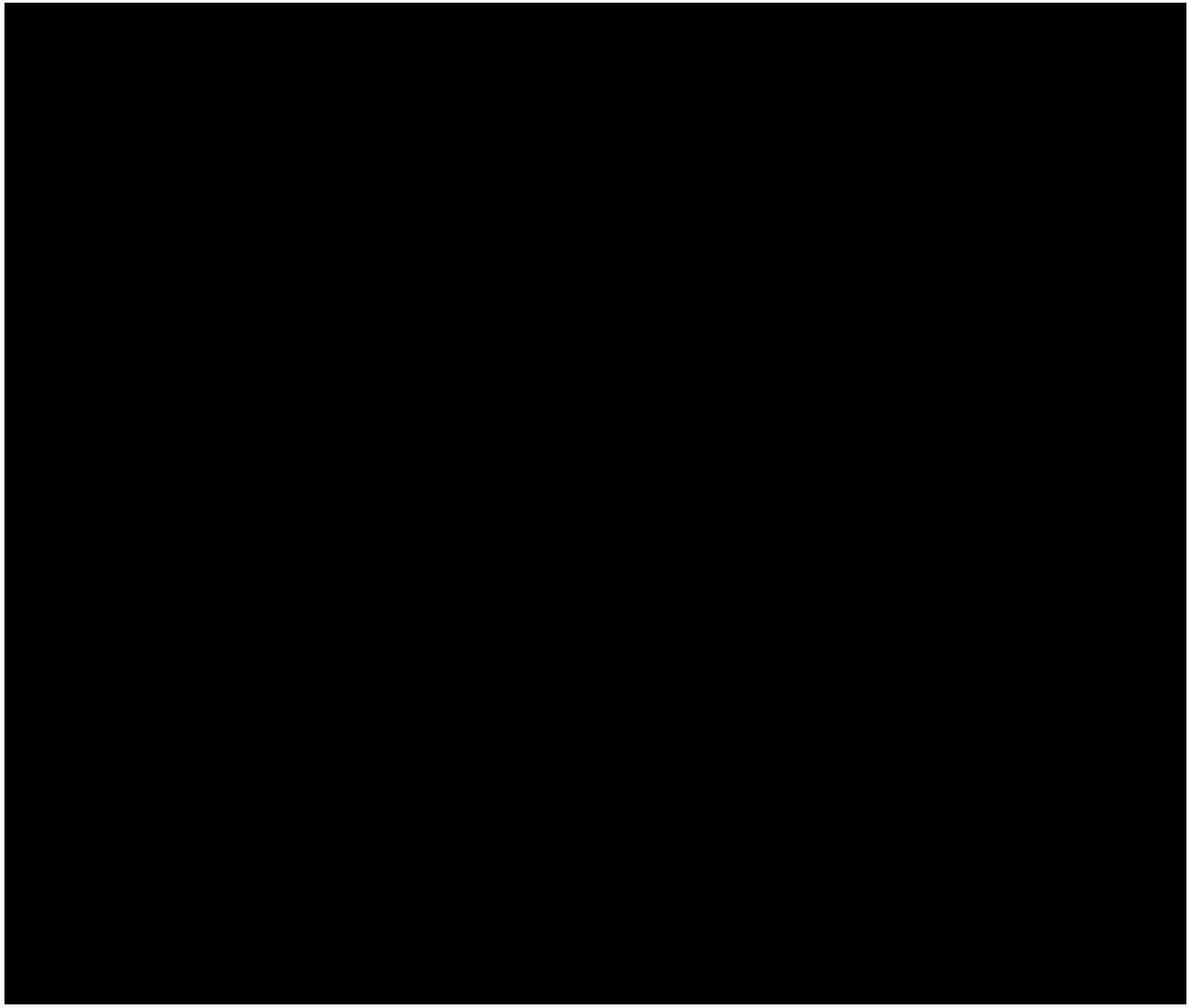
In our catalog



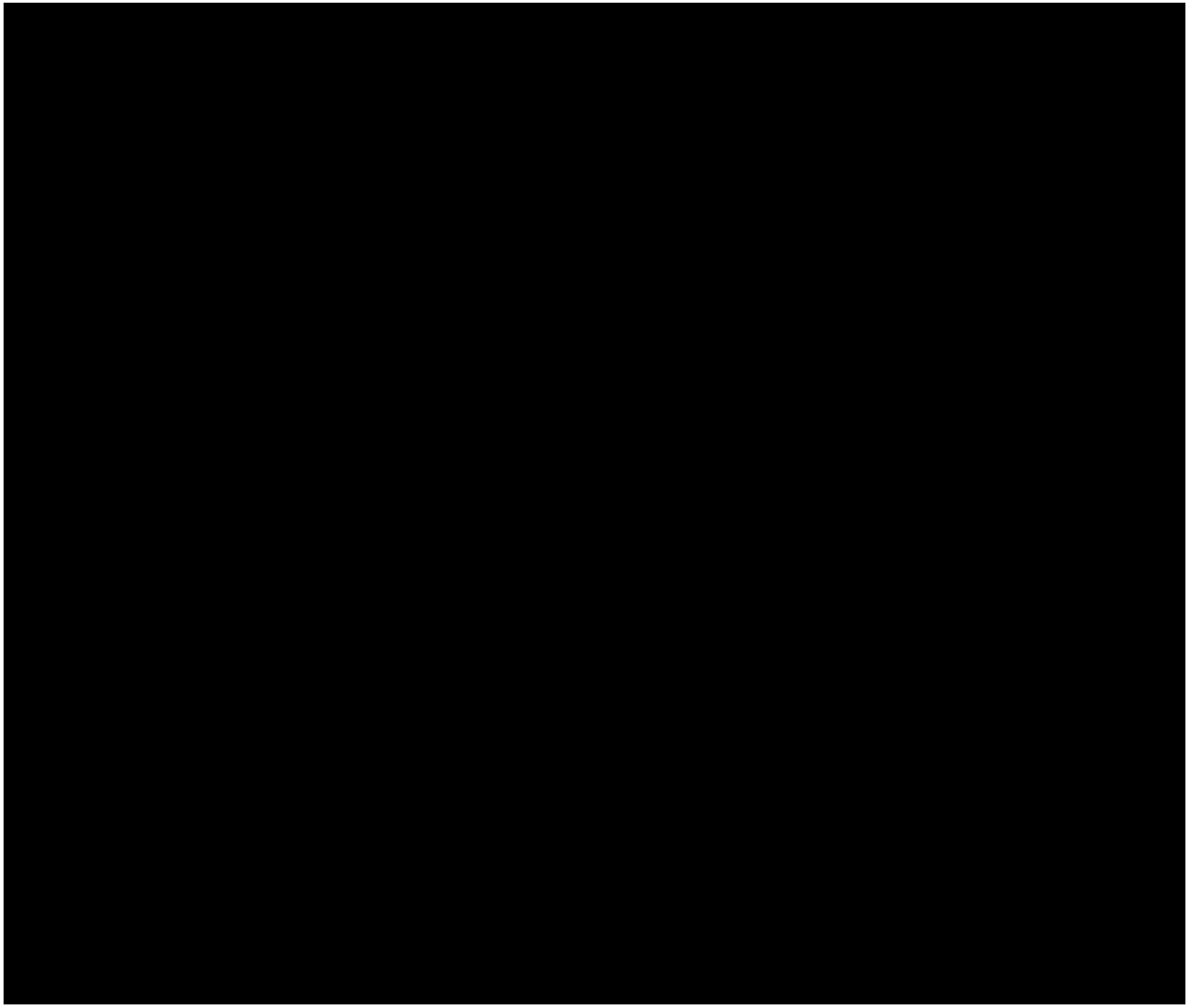
The strength and the weakness of the subject catalog

- **"One researcher… was interested in linguistic studies of the Cockney dialect. He simply typed 'Cockney' as a keyword into our catalog… [and] missed most of the linguistic studies….. The proper LC subject heading 'English language -- Dialects -- England -- London' rounds up in one categorical grouping all such works scattered by variant keywords-- and variant languages"**
  - **Thomas Mann, "Research at Risk", in *Library Journal* online site, article dated June 15, 2005**

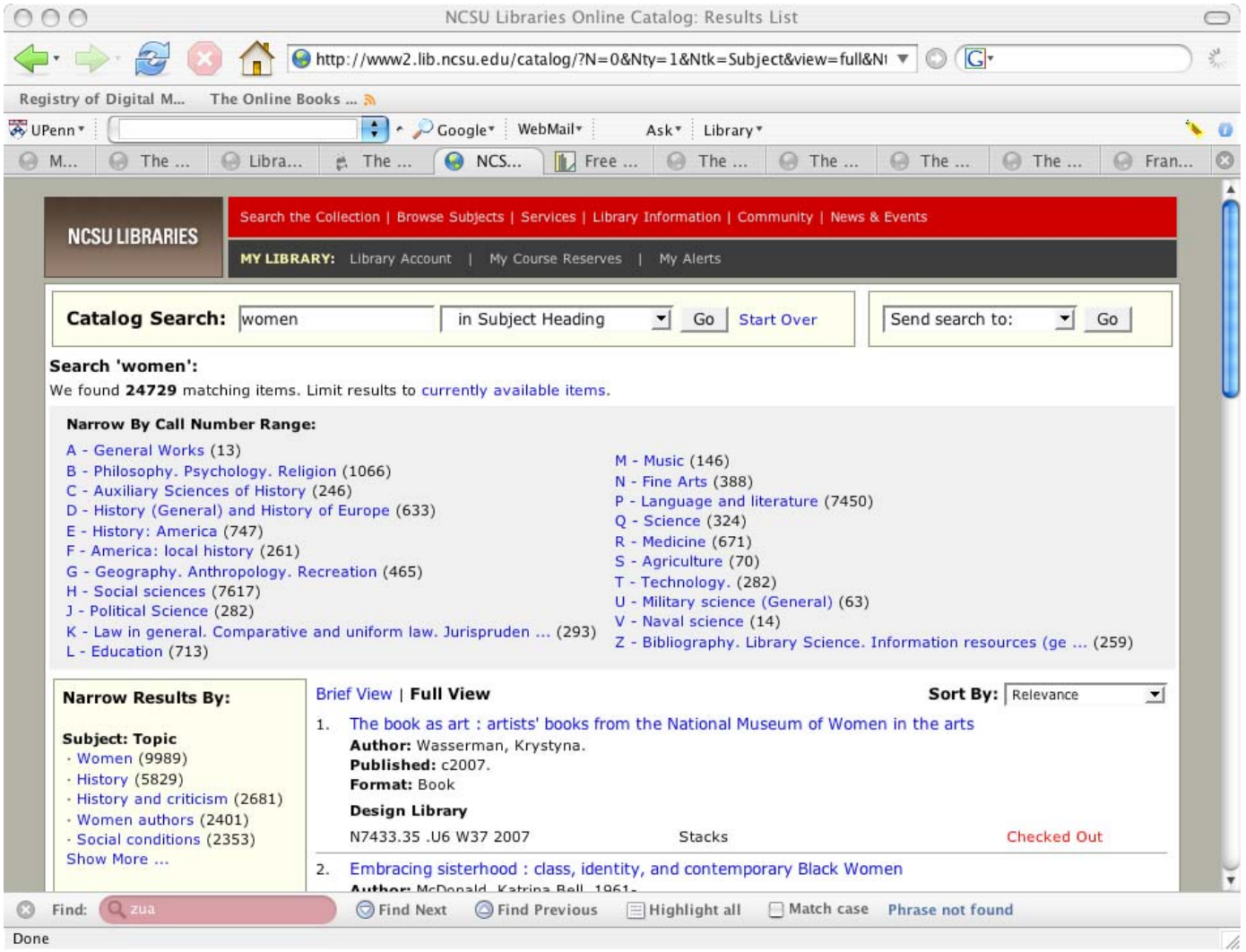
How do we get there?



Cataloging is messy

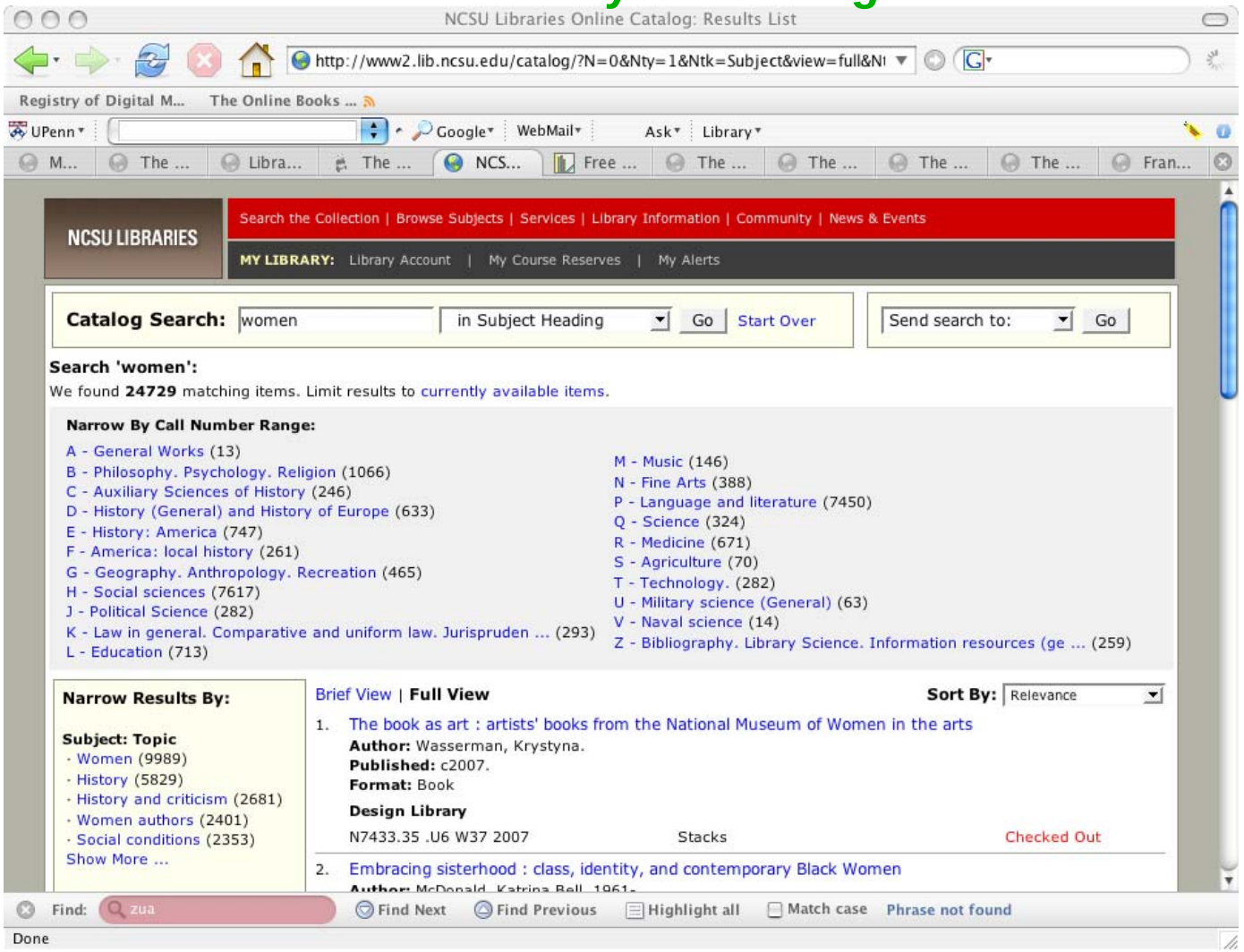


Better browsing with facets



Better browsing with facets

But what are you missing?



So, what are subject maps?

- **Organized networks of well-defined subject terms *and relationships between them***
  - **Applied and customized to particular collections of items**
- **Clustered, side-by-side displays of subjects, items, and relationships in ordinary text-based Web browsers**
  - **Other display options also possible**
- **Designed to function like geographic maps (though they don't look much like them)**
  - **Get users to a [subject] area they're interested in**
  - **Let them see what's there, and in nearby areas, at a glance**
  - **Show them routes to get to nearby areas, so they can home in on what's most useful to them**
  - **Detail and layout helps compensate for**
    - » **Imprecise cataloging ("Hotel's just off the Metro from LA")**
    - » **Differences in concepts and names ("You mean light rail?")**
- **Work well with detailed ontologies like LCSH**

LCSH? Why in heaven's name voluntarily use LCSH?

- **Subject headings are expensive to assign, maintain**
  - **Though not as expensive as a full MARC record**
- **They represent a >100 year old legacy system**
  - **With all the backward compatibility issues, mismatches with user expectations, "prejudices and antipathies" that implies**
- **Our patrons aren't using subject headings-based discovery much**
  - **But with the tools we give them, can you blame them? [see critiques by Karen Schneider and others]**
- **LCSH may be on its way out, too….**

Reasons to use LCSH (can we at least say “for now”?)

- It’s the metadata and ontology we have at hand
  - That’s the flip side of it being a >100 year old legacy system
  - Many resources of interest are described by it, and have no other subject metadata (and might never have)
- Enables great precision in identifying subject areas
  - Millions of terms (including 200,000+ authorized headings), careful definitions, lots of explicit and implicit relationships
  - Can pinpoint items with subject as main topic more precisely than one can with keyword search (which isn’t as sensitive to main vs. incidental)
  - Much larger array of effectively controlled areas than tags or keywords
- Subject maps will make it easier for users to navigate sensibly with LCSH
- Subject maps and related technologies may also make it easier to make quicker changes to LCSH, transition to better ontologies

Aggregated subject map example

- **"American Discovery" demo: 40,000 records of various kinds from various OAI-harvested sources**
  - **10,000+ books from Making of America (Michigan)**
  - **3.000+ books and images from Documenting the American South (UNC)**
  - **26,000+ other books selected from American Memory, Early Canadiana Online, Celebration of Women Writers, etc. (The Online Books Page, Penn)**
- **That's not very big, though, is it?**
  - **It's big enough to demonstrate basic aggregation issues**
  - **We'll show larger scale in a bit**
- **Live online demo:**
  - **http://onlinebooks.library.upenn.edu/adsubjects.html**
- **Did it work?**

Building subject maps

Build them automatically:

- **First, create a collection-independent map based on authorities**
- **Second, tweak it based on local needs and data**
  - **“Tweaks” can overlay, inform centrally maintained authorities**
  - **Sources include usage data, domain-specific knowledge bases**
- **Third, adapt it to a particular [set of] collection[s]**
  - **Start by mining bibliographic data**
  - **Add terms not already in collection-independent version**
  - **Prune “dead ends” from collection-independent version**
  - **Apply rules to create additional subject relationships**

Where do terms and relationships come from?

- From bibliographic data
  - Terms used in a catalog generally assumed to be valid
  - If suitable terms not present, may be inferrable from other info
  - For relationships, consider assignment patterns: e.g. name as first subject followed by “<topic> -- Biography”
- From authority files and other “canonical” data
  - “BT”, “NT, “UF”; lists of state names and abbreviations
- From user data
  - Look at search logs, tag usage and correlations, etc.
- From facet analysis
  - Which facets can be added or dropped? Which can have broader or narrower terms substituted? Permutations?
- From lexical and domain analysis
  - If “X and Y” relates to Y, it probably also relates to X
  - Recognizing geographic terms and abbreviations
- Inclusion rules can be added or removed as required

Well-ordered ontology? Dream on

- **Making of America Books**
  - **LCSH, but sometimes uses obsolete terms**
- **Documenting the American South**
  - **Images use Thesaurus of Graphic Materials, not LCSH**
- **Online Books Page index**
  - **Didn't assign LCSH terms to many items**
  - **But did have LC Call Numbers**

- **Many other collections appear to use uncontrolled or collection-specific keywords**
  - **Institutional repositories, special image collections, user-tagged items**

How to deal with subjects from more than one ontology?

- **1. Throw them in together, hope for the best**
  - **May sometimes be the simplest, cheapest approach**
  - **Terms not in "standard" ontology may be isolated in map, but still sought by users**
  - **Automated techniques can often integrate terms that follow general patterns of ontology:**
    - » **Digital libraries -- Congresses -- California -- Pasadena**
    - » **Rose Bowl Stadium (Pasadena, Calif.)**
  - **Automated analysis may also identify "islands" within subject maps that could use integration into map**
    - » **" 'Housing bubble' is isolated, but is used a lot"**

How to deal with subjects from more than one ontology?

- 1. Throw them in together, hope for the best
- 2. Normalize to a preferred ontology
  - LCCNs -> mapped to most tightly defined LC subject heading
  - Obsolete terms -> resolve “used for” associations; reformat old styles (e.g. geographic headings)
  - Uncontrolled keywords -> Correlations (manual or automated tag correlation); clustering (see Newman and Hagedorn work with OAIster)
  - Appropriate when alternate terms not well controlled, or aren’t very suitable as a basis for browsing
  - But you may want to label auto-assigned terms
  - And do you really want everything to be LCSH?

How to deal with subjects from more than one ontology?

- 1. Throw them in together, hope for the best
- 2. Normalize to a preferred ontology
- 3. Make two subject maps, link them in appropriate places
  - May be appropriate when audience, type of materials is clearly distinct
  - E.g. MeSH for medical researchers and specialist medical literature vs. LCSH for nonmedical researchers and nonspecialist literature on medicine
  - Establish junction points where appropriate (e.g. Cancer (LCSH) <-> Neoplasms (MeSH)). Crosswalks exist.
  - Not so appropriate where searchers often interested in items in both ontologies (e.g. TGM and LCSH)

How to deal with subjects from more than one ontology?

- 1. Throw them in together, hope for the best
- 2. Normalize to a preferred ontology
- 3. Make two subject maps, link them in appropriate places.
- 4. Build a multi-ontology subject map
  - One ontology may dominate (e.g. LCSH's 200,000+ authorized headings vs. TGM's 6,000+)
  - Some terms in one ontology related to ones in other
    - » Tombs & monuments (TGM) -> Two LCSH terms
  - Other subjects may have two equivalent terms
    - » Churches (TGM) = Church buildings (LCSH)
  - How do you make this clear in the interface?

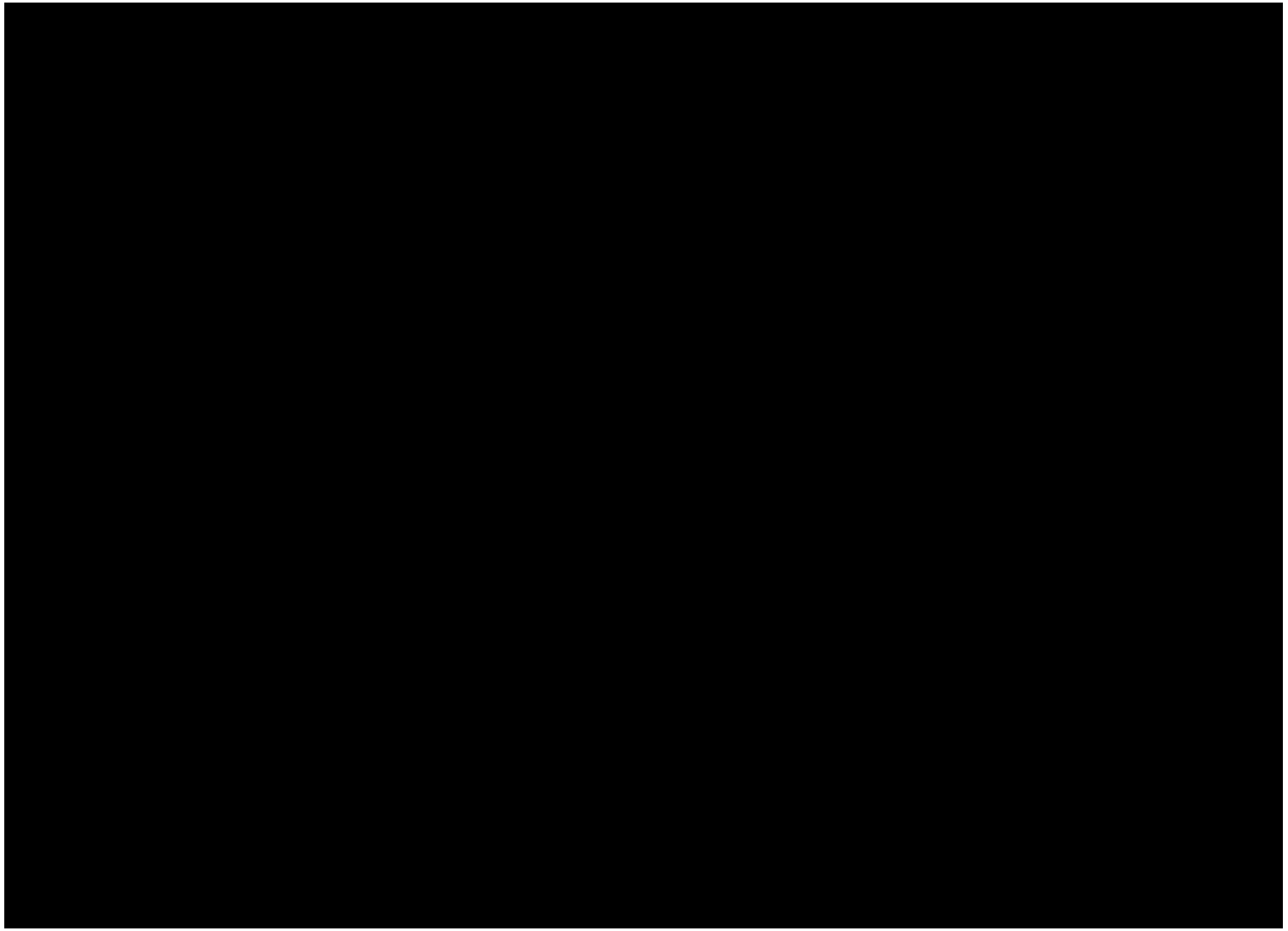
Bringing a new collection into an aggregation

- **Examine the metadata used**
  - **How are subjects represented?**
  - **What ontologies are used, if any?**
  - **How reliable or precise are they?**
  - **Should you normalize or suppress terms?**
- **Survey items in the collection, items already present**
  - **Do you need to deduplicate?**
  - **For duplicates (at manifestation or work level), should one collection's metadata override another's?**
  - **If cataloging is good, union of subject terms may be best**
- **Some expert judgment required for best fit**
  - **But may be feasible to do this collection-by-collection (please, not item-by item!)**

But why stop with just digital collections?

- **We have lots of Americana and other useful content in our print holdings too**
  - **Franklin lists over 3 million print items**
  - **Over 1 million subject terms**
  - **We can build subject maps for it too**
    - » **Can be newly generated from harvested data in ~40 minutes on up-to-date hardware with 8GB memory**
- **Live online demo:**
  - **http://onlinebooks.library.upenn.edu/adsubjects.html**
  - **(Not yet aggregated with earlier digital collections, but can be done with a little more programming)**
- **Did it work?**

Subject maps on Franklin



Can I contemplate doing this with the OPAC I'm stuck with?

- **We can use some tools to do it with our ILS (Voyager)**
  - **SQL: Data-mine and query authority and bibliographic metadata**
  - **JavaScript: Rewrite catalog web pages to link out to map tools**
  - **URLs with fielded queries: Link back to the catalog from maps**
- **We've already used these techniques to integrate PennTags with our Franklin catalog**
- **Subject map-aware catalogs might be even nicer, but the tools above suffice to get subject maps going**

But can subject maps play with other cool tools?

Subject maps

Facets

Full text search

Social tagging

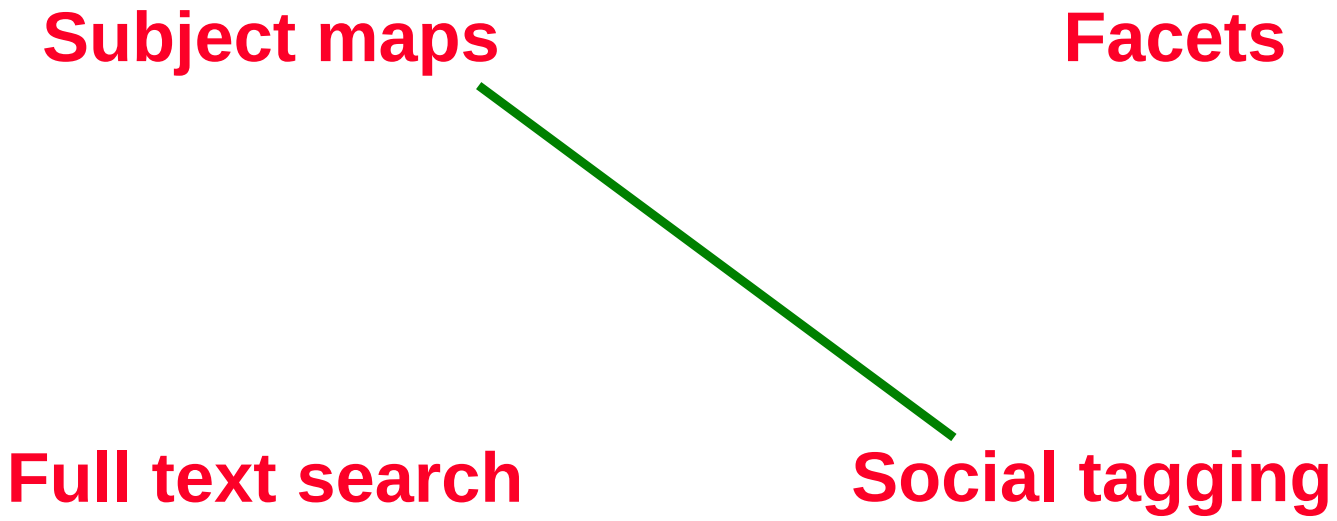
A larger repertoire of discovery tools

Subject maps ——— **Facets**

Full text search **Social tagging**

* Subject maps, non-subject facets (e.g. media type, language, availability), can be used simultaneously
* Subject maps can be annotated when built so only terms that apply under arbitrary facet limitations get shown

A larger repertoire of discovery tools



- Tags can be correlated with formal ontology terms, as discussed earlier

A larger repertoire of discovery tools

Subject maps **Facets**

Full text search **Social tagging**

- **Search of full text (or metadata) can be used to identify frequently occurring subjects to browse**
- **Or, full text search limit results to items falling within a particular subject cluster**

Some early promising signs and speculations

- **Since maps introduced to The Online Books Page, users making substantially heavier use of subject browsing**
  - **And going deeper into the collection than before**
  - **Adding basic geographic smarts was easy**
- **Demos with Franklin, multiple sources show feasibility of building, using maps with larger collections**
  - **Noise filtering / normalization an issue with any large collection**
  - **Scaling issues seem to be increasingly tractable**
    - » **As memory gets bigger and cheaper, map building for larger collections can be done on cheaper hardware**
    - » **Map navigation is computationally cheap already (since it's only looks at local portions of map)**
    - » **We're looking at more advanced techniques for presenting heavily populated map portions more effectively to users**
- **Could we scale this up to the global level?**
  - **Why not include what your users can get via ILL, other means?**

What next?

- **Try putting it in front of our university's users**
  - **Perhaps as add-on to Franklin, or interface to E-resources**
- **Try aggregating more collections**
- **Develop smarter map building and display techniques**
- **User studies?**

- **Think about how our users will discover the best resources (ours or others') in a networked, highly digital world**

Conclusions (again?)

- Subject browsing is an important mechanism for resource discovery across aggregated collections
- Detailed ontologies like Library of Congress Subject Headings can form the basis for useful browsing, if used with appropriate tools
- Subject maps are useful and practical tools for exploring collections with complex ontologies, maintaining those ontologies

Subject maps build on library strengths to better connect our users with the resources they need in a distributed, digitized information environment

- For more information (demos, whitepapers…):
  - Web: http://labs.library.upenn.edu/subjectmaps/
  - Email: ockerblo@pobox.upenn.edu
- Thanks!