Metadata - general introduction

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Cataloguing Online Resources: an Introduction to Metadata for Librarians, Manchester, 26 April 2006

http://www.ukoln.ac.uk/

Event timetable

- 09:30 Registration
- **10:00 Metadata - general introduction**
- **10:15 Discovery metadata**
- 11:00 *Break*
- 11:15 Learning Object metadata
- **12:00 Other types of metadata**
- 13:00 *Lunch*
- 14:00 Metadata in practice - JORUM & LOM
- 15:00 Feedback and final discussion
- 15:30 *Close*

Session overview

- Metadata - general overview
  - Definitions
  - Some basic questions
  - Metadata standards

Defining metadata (1)

- Some definitions:
  - Literally, "data about data"
    - Defines the basic concept, but is (perhaps) not very meaningful
    - Refers to everything and nothing (Wendy Duff, 2004)
  - "Machine-understandable information about Web resources or other things" - Tim Berners-Lee, W3C (1997)

Defining metadata (2)

- "Structured data about resources that can be used to help support a wide range of operations - Michael Day, 2001
- "Structured information that describes, explains, locates, or otherwise makes it easier to retrieve, use or manage" information objects - NISO, 2004
  - Hints at the many roles metadata can support

Defining metadata (3)

- Metadata is now typically defined by *function*
  - "Data associated with objects which relieves their potential users of having to have full advance knowledge of their existence or characteristics" (Dempsey & Heery, 1998)
  - Popular categorisation:
    - » Descriptive metadata
    - » Structural metadata
    - » Administrative metadata

What functions can be supported?

- Resource disclosure & discovery
- The retrieval and use of resources
- Resource management, including preservation
- Verification of authenticity
- Intellectual property rights management
- Commerce
- Content-rating
- Authentication and authorisation
- Personalisation and localisation of services
- …

To what can metadata be applied?

- "Web resources or other things," e.g.:
- Web sites, Web pages, digital images, databases, books, museum objects, archival records, collections, services, geographical locations, organisations, events, concepts, … even metadata itself

Where can metadata be found?

- Within a resource, e.g.:
  - Title page and table of contents (books), META tags in document headers (Web pages), ID3 metadata (MP3), "file properties" (office documents), EXIF data (images)
- Directly linked to the resource, e.g.:
  - Link rel="meta" elements (Web pages)
- Independently managed in a separate database; can be linked by identifiers
  - This is the most common approach

How important is metadata?

- … "is recognised as a critically important, and yet increasingly problematic and complex concept with relevance for information objects as they move through time and space" -- Gilliland-Swetland (2004)

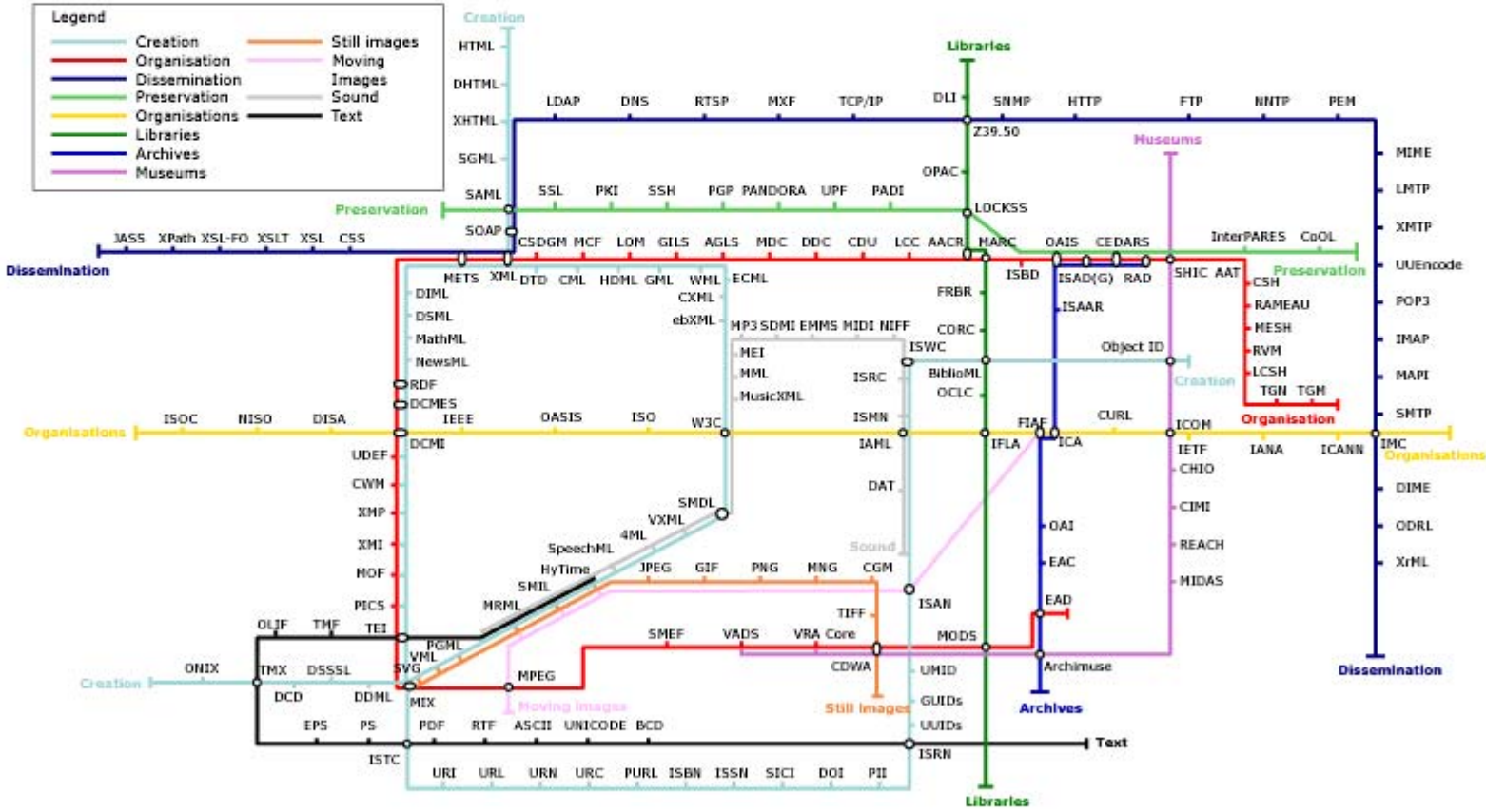
Metadata standards (1)

- But there are a large (and growing) number of metadata initiatives, formats, schemas, etc.
  - See James Turner's MetaMap for one attempt to visualise the metadata information space:
  - **http://mapageweb.umontreal.ca/turner/meta/english/**

MetaMap

[© 2004 James M. Turner, Véronique Moal, & Julie Desnoyers]

Position the mouse over an acronym to see what it stands for in a popup window.
Click on the acronym to see its definition and a link to its official site.



Metadata standards (2)

- Typically defined by "resource management communities"
  - Different traditions, perspectives, functional requirements
- Typically comprise:
  - A "conceptual model" (sometimes not explicit)
  - A set of named components ("terms", "elements" etc) and documentation on their meaning and use
  - A specification of how to represent a metadata instance in a digital format (binding)

Some examples (1)

- Bibliographic:
  - MARC (Machine-Readable Cataloguing) formats, e.g. MARC21
    - Exchange format since 1960s
    - Content often based on family of related standards, e.g. the ISBD series, AACR2
  - MODS (Metadata Object Description Schema)
    - A subset of MARC
  - ONIX
    - Used by publishers and the book trade

Some examples (2)

- Archives and records:
  - ISAD(G) (General International Standard Archival Description)
  - EAD (Encoded Archival Description)
  - EAC (Encoded Archival Context)
  - Recordkeeping metadata (e.g., ERMS (The National Archives), RKMS)
- Museum objects (and collections):
  - SPECTRUM

Some examples (3)

- Digital images:
  - VRA Core, NISO Technical Metadata for Digital Still Images
- Government information:
  - AGLS, e-GMS
- Learning objects:
  - IEEE LOM, UK LOM Core, IMS specifications
- Multimedia:
  - MPEG-7, MPEG-21 (for rights information)

Summing up

- Metadata is ubiquitous
- Metadata enables people and software applications to do things (functions)
  - Not only about "discovery"
  - Different functions require different metadata
- There are many different standards
- Challenges remain in working across standards, or in using standards in combination

Discovery metadata - Dublin Core, MODS, MARC, ...

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Session overview

- Resource discovery
- Dublin Core
- The MARC formats
- MODS

Resource discovery (1)

- A basic function of metadata
- Part of information retrieval
- Cutter's principles from "Rules for a Dictionary Catalog" (1876), slightly paraphrased:
  - To enable a person to find a [book] of which either the author, title or subject is known
  - To show what a [library] has by a given author, on a given subject, or in a given kind of literature
  - To assist in the choice of a [book] as to its edition (bibliographically) or to its character (literary or topical)

Resource discovery (2)

- A particular challenge in Web environment
  - Resource providers have moved into a **shared** network space
  - Recognition that users wish:
    - "to refer to intellectual and cultural materials flexibly and transparently without concern for institutional or national boundaries" (Dempsey, 2000)
- This is the problem that Dublin Core is designed to address (cross-domain discovery)

Resource discovery (3)

- We will now look in more detail at three standards *primarily* developed to support resource discovery
  - Dublin Core
  - The MARC formats
  - MODS

Dublin Core basics

- Perhaps the most well-known metadata initiative (there are many implementations)
- Named after a workshop held in Dublin, Ohio - a suburb of Columbus
- Mainly focused on cross-domain resource discovery
- A suite of standards (and other activities) organised as part of the Dublin Core Metadata Initiative (DCMI)

DCMI mission

- Providing simple standards to facilitate the finding, sharing and management of information, by:
  - Developing and maintaining international standards for describing resources
  - Supporting a worldwide community of users and developers
  - Promoting widespread use of Dublin Core solutions

DCMI brief history (1)

- Mid-1990s
  - Challenge of discovery on the Web
  - Search engines providing many hits, but little precision (pre Google)
  - Recognition that the traditional library approach to cataloguing could not scale to Web resources
- 1995 - first workshop
  - Hosted by OCLC at Dublin, Ohio
  - Primarily focused on Web resource discovery (document-like objects)
  - Resulted in interdisciplinary consensus on 13 metadata elements

DCMI brief history (2)

- 1996 - 2nd and 3rd workshops:
  - DC-2 (University of Warwick)
    - Recognised that DC elements would need to combine or co-exist with other types of metadata (modularity)
    - Warwick Framework devised to deal with this
  - DC-3 (Dublin, Ohio)
    - Workshop convened to deal with images (expanding beyond document-like objects)
    - Explicit focus now on cross-domain resource discovery
    - First identification of the 15 core elements

DCMI standardisation

- Dublin Core Metadata Element Set
  - Version 1.0: IETF RFC 2413 (1998)
  - Version 1.1: CEN Workshop Agreement CWA 13874 (2000), NISO Z39.85-2001, ISO 15836:2003
  - DCMI Recommendation (2004)
- DCMI Metadata Terms
  - DCMI Recommendation (latest version, 2005)
  - Specifies all metadata terms maintained by DCMI: elements, element refinements, encoding schemes, vocabulary terms
- DCMI Abstract Model
  - DCMI Recommendation (2005)

Dublin Core elements (1)

- Interdisciplinary consensus on simple element set for *resource discovery*
  - 15 elements
  - All optional
  - All repeatable
- Not intended for complex resource description
  - Initial idea of “simple document-like object”
  - Simplicity of semantics, ease of use
- Provides *basic* “semantic interoperability”
  - Across domains, across language communities
  - Does not provide detailed cataloguing rules
- A set of 15 broad “buckets”…

Dublin Core elements (2)

- Title
- Subject
- Description
- Creator
- Publisher
- Contributor
- Date
- Type
- Format
- Identifier
- Source
- Language
- Relation
- Coverage
- Rights

Dublin Core elements (3)

- ***Not*** a replacement for richer descriptive standards
- Can provide 15 “windows” into richer resource descriptions
  - disclose rich description in simple form
  - semantic cross-walks, mappings to existing data
  - export rather than create
- If metadata is language ...
  - … then DC is a “pidgin” language for use by “tourists on the Internet commons” (Thomas Baker)

Dublin Core elements (4)

- Small vocabulary, simple grammar/structure
  - Resource has Title “An Introduction to Dublin Core and the DCMI”
  - Resource has Subject “Metadata”
- Not as subtle/powerful as separate languages - but can be useful!

Extending Dublin Core

- Element refinements:
  - Narrow the meaning of a DC element
  - e.g. "date modified" v "date"
- Encoding schemes:
  - Provide additional information about a value
  - e.g. can indicate that a subject value is a Library of Congress Subject Heading
- The "Dumb-Down" principle
  - Provides rules for transforming "qualified" description into "simple" description
- the "One-to-One" rule
  - A DC description describes exactly one resource

Dublin Core Application Profiles

- In practice, metadata implementers
  - **Combine** elements from different sources (e.g. DC plus elements from other schemas, “local” elements)
  - **Refine** definitions of elements
  - **Constrain** use of elements
- Application profiles
  - If simple DC is a “pidgin”, an application profile is a “regional idiom or creole”! (Thomas Baker)
  - Element set plus policies, guidelines
  - Some DCMI Working groups developing application profiles for specific domains (government, education)

DC Application Profiles: examples

- "Simple Dublin Core"
  - Use of the 15 properties of the DCMES
  - All optional and repeatable
  - Values represented by value strings
  - No vocabulary or syntax encoding schemes
- UK eGovernment Metadata Standard (eGMS)
  - Use of selected properties from DCMI vocabularies, additional properties
  - Guidelines on use of properties
  - Some properties mandated/recommended
  - Some vocabulary encoding schemes mandated/recommended
  - Guidance on content of value strings

Some applications of Dublin Core

- Embedded in Web pages
- Integrated resource discovery services
  - For example
    - Subject Gateways - Resource Discovery Network
    - OAI Service Providers - OAIster
    - Image services - Picture Australia

DC embedded in X/HTML

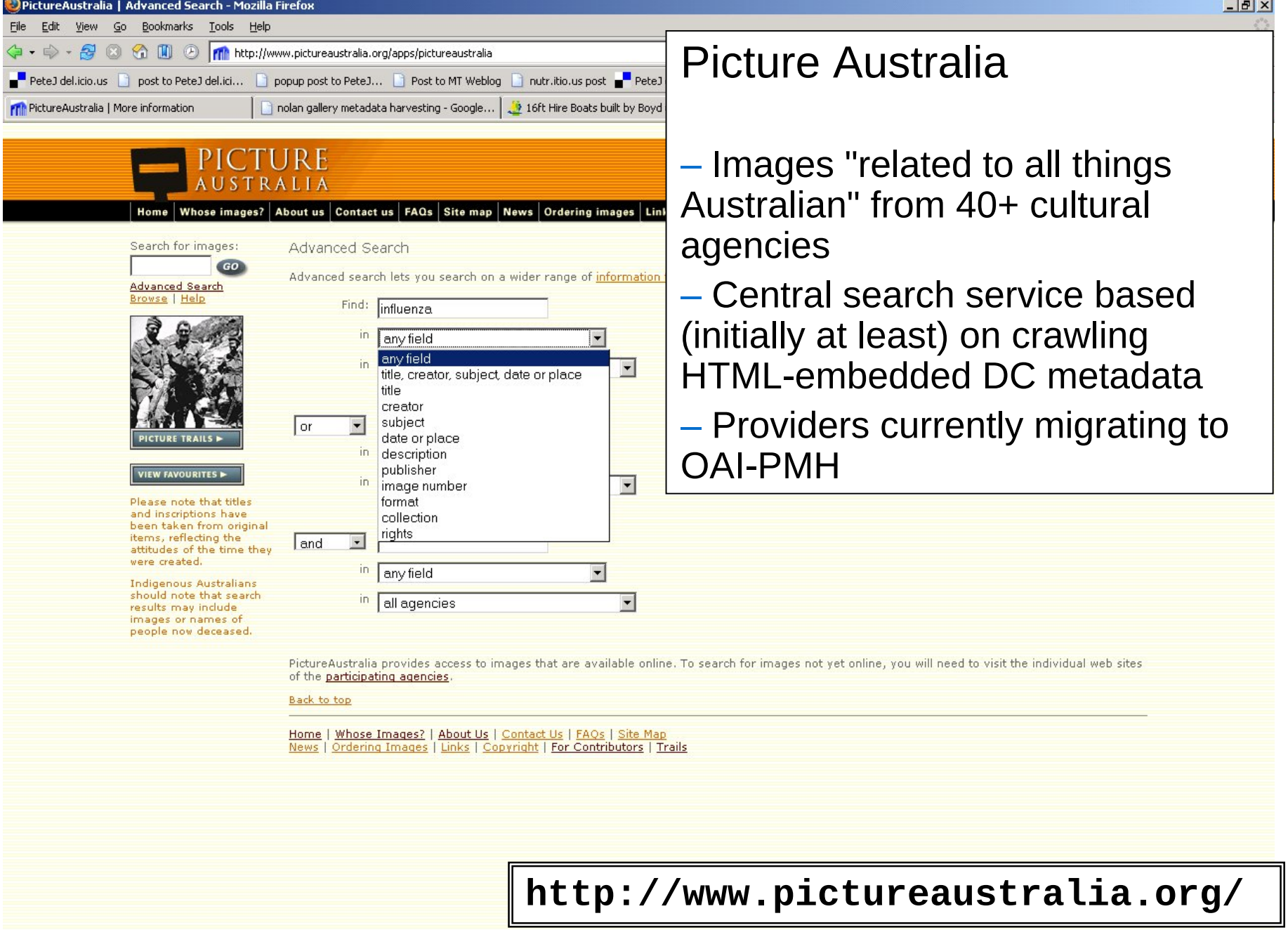
- Search crawlers can extract metadata from individual pages
- However, little or no use by the major search engines
  - Robot spamming problems
  - Lack of metadata (or quality-control)
  - Availability of better indexing tools, e.g. Google's PageRank algorithm
- But, useful in controlled environments

Picture Australia

– Images "related to all things Australian" from 40+ cultural agencies

– Central search service based (initially at least) on crawling HTML-embedded DC metadata

– Providers currently migrating to OAI-PMH



http://www.pictureaustralia.org/

PICTURE AUSTRALIA

More information

Your search for **influenza** in title found 28 images.
Displaying image: 2

Add to favourites

Title	[Army personnel being inoculated against **influenza** at an Army depot near Melbourne]
Subject	Walter and Eliza Hall Institute of Medical Research.
Subject	Immunization -- Australia
Description	Shows Capt. Steven Williams of the Walter and Eliza Hall Institute, on loan to the army to vaccinate personnel.
Image number	H99.201/1123
Format	photograph : gelatin silver ; 12.5 x 16.5 cm. approx.
Managed by	Item held by State Library of Victoria
Collection or series	IspartOf Argus newspaper collection of war photographs. World War II.
Date or place	[ca. 1944]
Rights	Reproduction rights: State Library of Victoria.
Go to	Original image

Search for images: GO
in these results
Advanced Search
Browse | Help

Army personnel being inoculated against influenza at an Army depot near Melbourne [picture] by - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://www.slv.vic.gov.au/argus/0/0/2/doc/an002190.shtml

PictureAustralia | nolan gallery metadata harvesting - Google...

State Library of Victoria

Catalogues & Databases | Collections | Services

Pictures Catalogue >

Army personnel being inoculated against influenza at a
near Melbourne [picture]
Date(s) of creation: [ca. 1944]
photograph : gelatin silver ; 12.5 x 16.5 cm. approx.
Reproduction rights: State Library of Victoria.
Accession Number: H99.201/1123
Image Number: an002190

Feedback on this image

State Library of Victoria is a contributor to PictureAustr

Victoria The Place To Be

view-source: - Source of: http://www.slv.vic.gov.au/argus/0/0/2/doc/an002190.shtml - Mozilla Fi...

File Edit View

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN">
<html xmlns:SLV>
<head>
<title>Army personnel being inoculated against influenza at an Army depot
near Melbourne [picture]   by  </title>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
<meta NAME="description" CONTENT="Shows Capt. Steven Williams of the Walter
and Eliza Hall Institute, on loan to the army to vaccinate personnel. ">
<meta NAME ="keywords" CONTENT="Ships,Gelatin silver photographs,Walter and
Eliza Hall Institute of Medical Research,Walter and Eliza Hall Institute of
Medical Research,state,library,image,victoria,melbourne">
<link rel=" schema.AGLS"
href="http://www.naa.gov.au/recordkeeping/gov_online/agls/1.2">
<meta NAME="DC.Title"LANG="en"CONTENT="[Army personnel being inoculated
against influenza at an Army depot near Melbourne] ">
<meta NAME="DC.Subject" SCHEME="LCNA" CONTENT="Walter and Eliza Hall
Institute of Medical Research.">
<meta NAME="DC.Subject" SCHEME="LCSH" CONTENT="Immunization -- Australia">
<meta NAME="DC.Description" CONTENT="Shows Capt. Steven Williams of the
Walter and Eliza Hall Institute, on loan to the army to vaccinate
personnel. ">
<meta NAME="DC.Date.Created" SCHEME="ISO8601" CONTENT="5 September 2005">
<meta NAME="DC.Type" CONTENT="Gelatin silver photographs. ">
<meta NAME="DC.Format" CONTENT="photograph : gelatin silver ; 12.5 x 16.5
cm. approx. ">
<meta NAME="DC.Identifier.URL"
CONTENT="http://www.slv.vic.gov.au/argus/0/0/2/doc/an002190.shtml">
<meta NAME="DC.Identifier.URL.thumbnail"
CONTENT="http://www.slv.vic.gov.au/argus/0/0/2/tn/an002190.jpg">
<meta NAME="DC.Identifier" CONTENT="H99.201/1123">
<meta NAME="DC.Source" CONTENT="Item held by State Library of Victoria">
<meta NAME="DC.Language" SCHEME="RFC 1766" CONTENT="en">
<meta NAME="DC.Relation" CONTENT="IspartOf Argus newspaper collection of
war photographs. World War II.">
<meta NAME="DC.Coverage.Temporal" SCHEME="ISO8601" CONTENT="[ca. 1944] ">
<meta NAME="DC.Rights" CONTENT="Reproduction rights: State Library of
Victoria.">
<style type="text/css" media="screen">
    @import "/headerpages/picsdb.css";
</style>
```

Find: user | Find Next | Find Previous | Highlight | Match case

Applet v51 started

Dublin Core and the OAI-PMH (1)

- Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH)
  - Fairly simple mechanism for sharing metadata records between applications
  - Has origins in “e-prints” community
  - Built on HTTP, XML
  - Allows a harvester to ask a repository for all or some of its metadata records (in a specified metadata format)
    - e.g., "Give me all your records updated since yyyy-mm-dd"

Dublin Core and the OAI-PMH (2)

- "OAI-DC" (Simple DC) is mandatory format
  - But no limitation on format that can be transferred (as long as can be described by XML Schema)

The MARC formats (1)

- Machine-Readable Cataloguing (MARC)
  - Will be familiar to most librarians
  - Integral to bibliographic cataloguing practice in many countries since the 1960s
  - Not a single standard, but a family of formats, e.g. MARC 21, UNIMARC, UKMARC
  - Facilitates the exchange of bibliographic data (shared cataloguing)
  - Determines search functionality in library catalogues (OPACs)

The MARC formats (2)

- Format first developed long before the term "metadata" was coined
- The MARC formats are standards for "the representation and communication of bibliographic and related information in machine-readable form" (MARC 21)
  - Machine-readable = data can be read, interpreted and manipulated by computers
  - Integrally linked with a range of standards that define field content, e.g. the International Standard Bibliographic Description (ISBD) series, cataloguing rules (e.g. AACR2, RDA)

MARC 21 basics

- Format resulted from the "harmonisation" of USMARC and CANMARC
- Maintained by Library of Congress and Library and Archives Canada
- Separate formats defined for:
  - Bibliographic data
  - Authority data
  - Holdings data
  - Classification data
  - Community Information data

MARC 21 Structure (1)

- Structure (based on ISO 2709)
  - Leader (24 characters)
  - Directory
  - Control fields (fixed length, mostly codes)
  - Variable fields
- Variable fields include:
  - Bibliographic description (0XX, 2XX, 3XX, 4XX), including notes (5XX) - typically follows ISBD
  - Main Entry (1XX), Other Added Entries (7XX, 8XX)
  - Subject Entries and Classification (0XX, 6XX)
  - Electronic Location and Access (856)

MARC 21 Structure (2)

- Variable Fields in a typical bibliographic record will look something like:


```
[...]
100 1  Hardy, Thomas $d 1840-1928
245 14 The return of the native $c Thomas Hardy
260 0  London $b Macmillan $c 1927
300    ix, 482 p $b map $c 19 cm.
[...]
```

MARC 21 - main features

- Builds on 150 years of modern cataloguing practice
- Builds on external standards (e.g. ISBN) and controlled vocabularies (e.g., name authorities, subject headings)
- Used for many types of bibliographic item: books, serials, maps, music, electronic resources, ...
- The basis of shared cataloguing services (e.g. OCLC's WorldCat)
- Many million MARC records in library systems

MARC 21 in XML

- MARC is now quite an old standard:
  - Initially developed to automate the printing of catalogue cards in 1960s
  - Legacy of the card format remains, e.g. the concept of main entry, poor linking between related items
  - Other legacy issues related to structure and character sets, e.g. ISO 2709
- MARC 21 XML Schema
  - Library of Congress developing a framework for working with MARC 21 in an XML environment
  - More flexibility for internal linking, developing crosswalks with Dublin Core and other formats, etc.

MODS basics (1)

- Metadata Object Description Schema
  - Maintained by Library of Congress Network Development and MARC Standards Office
  - More extensive than Dublin Core, 19 top-level elements, 64 at lower levels
  - Grounded in MARC 21
    - Includes a subset of MARC 21 fields (logically restructured), inherits some MARC semantics
  - Expressed in the XML Schema language
    - Is extensible
    - Can integrate with standards like METS

MODS basics (2)

- Specifically designed for library operations
  - e.g., Digital library systems, digitisation projects
- A possible alternative to Dublin Core?
  - Integrates better with the existing MARC corpus
  - Worth investigating for library-type operations
  - Untested in cross-domain contexts, MARC legacy may not be so useful here

Summing up:

- Three standards:
  - Dublin Core
    - A "core" for discovery of wide range of resources, focus on cross-domain discovery
    - Limited functionality, unless extended, e.g. using Application Profiles
  - MARC 21
    - A proven role for bibliographic data; not particularly suitable (or designed) for other resource types
  - MODS
    - Promising new XML-based standard, less complex than MARC 21, will have applications in libraries

More information:

- DCMI: http://dublincore.org/
- MARC 21: http://www.loc.gov/marc/
- MARC 21 XML Schema: http://www.loc.gov/standards/marcxml/
- MODS: http://www.loc.gov/standards/mods/

Discovery metadata - Dublin Core, MODS, MARC, ...

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