

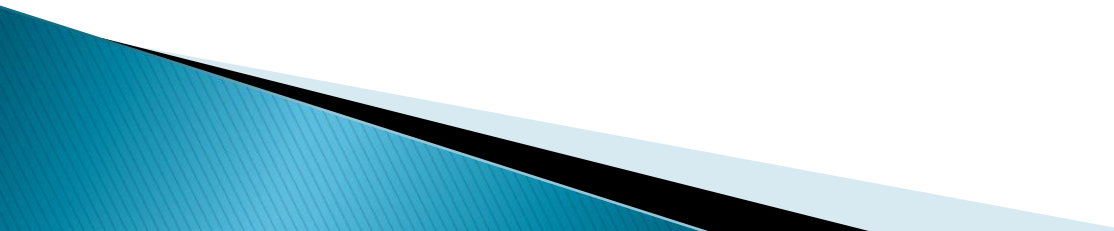
Controlled Vocabularies in Astronomy

Terrier Workshop: 24th October 2007

Alasdair J G Gray



Overview

- ▶ Vocabularies in astronomy
 - ▶ Generating machine processible vocabularies
 - ▶ Exploring with vocabularies
 - ▶ Future work
- 

Astronomical Vocabularies

- ▶ Many existing vocabularies
 - Astronomy and Astrophysics keywords (AAk)
 - Astronomical outreach imagery metadata tags (AOIM)
 - International Astronomical Union Thesaurus (IAU)
 - Universal content descriptors (UCDs)
 - Etc.
- ▶ Created for specific purposes
 - Tagging journal articles (AAk)
 - Tagging images (AOIM)
 - Library cataloguing and searching (IAU)
 - Describing data source column content (UCDs)
 - Many others

Application Problem

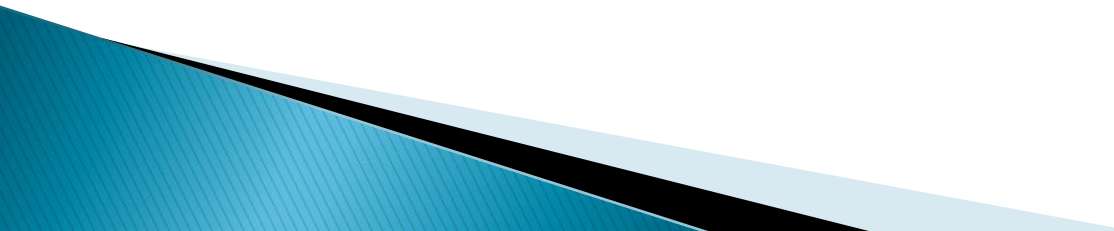
Requirements

- ▶ Search for information using keywords
- ▶ Return data from all available data sources
- ▶ Navigate result using
 - Generalisation: retrieve more data
 - Specialisation: reduce data by selecting specific topic
 - Related terms

Issues

- ▶ A data source is marked-up in one vocabulary
- ▶ Need to combine information from multiple sources
- ▶ Similar terms appear in the different vocabularies
- ▶ Vocabularies have different structures

Representing Vocabularies

- ▶ Capture vocabulary structure
 - Broader term/Narrower term relationship
 - Related term relationship
 - Use/Use for relationship
 - Synonym/Alternative term
 - ▶ Standardised representation
 - OWL: Rigid defined semantics, very expressive
 - SKOS: Loose semantics, highly explorable
 - ▶ Visualisation/exploration tools
 - ▶ Inter-vocabulary mappings (open issue)
- 

Astronomy Source Vocabularies

- ▶ Many different
 - Formats
 - Web page
 - Word document
 - PDF document
 - Structures
 - Implicit/explicit
 - Hierarchical
 - Collections

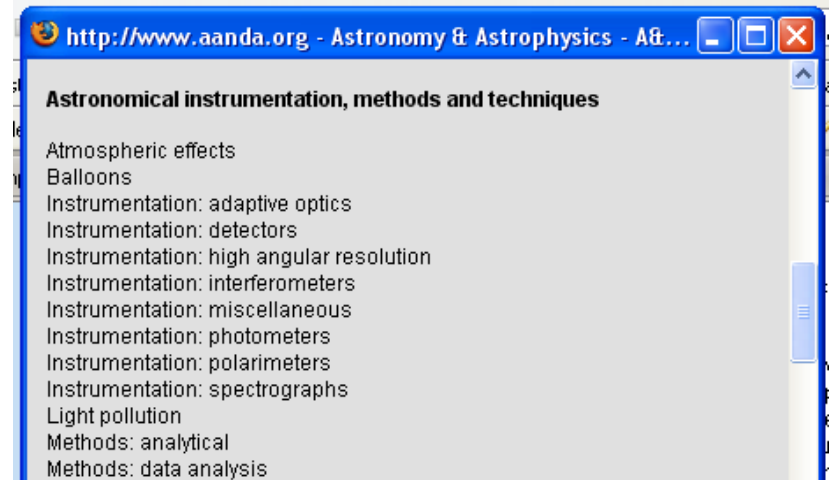
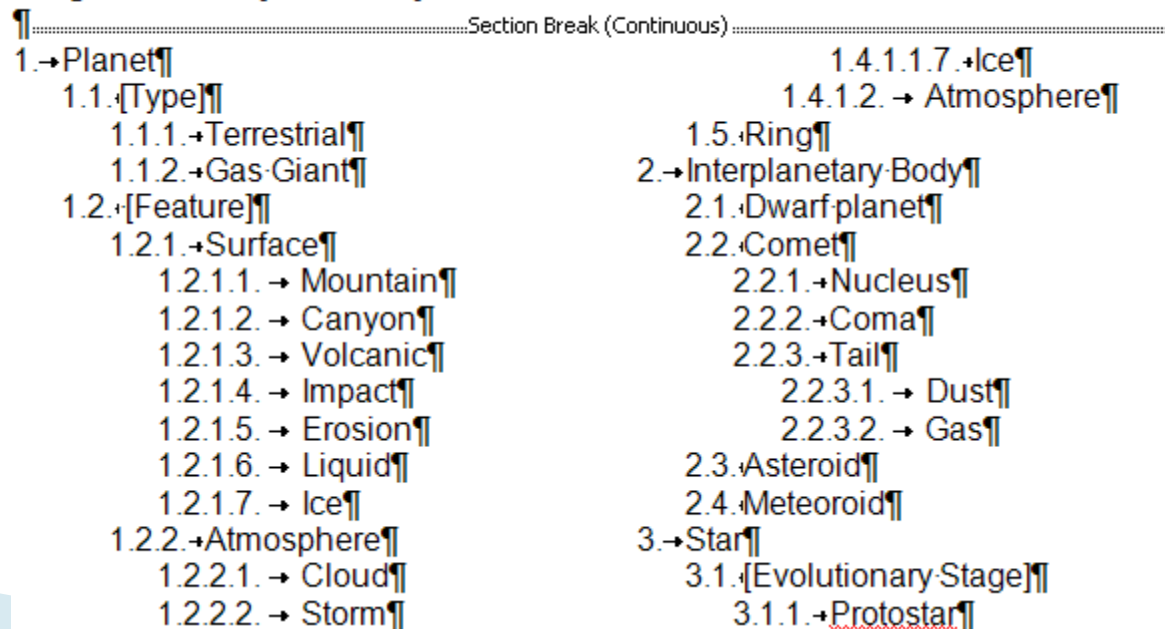


Image Taxonomy Hierarchy



SKOS Encoding

- ▶ Flat xml files published by Frederic Hessman
- ▶ Added structure explicitly
- ▶ XSLT transformation to SKOS

```
<skos:Concept rdf:about="ivo://ivoa/VOcabulary/AAkeys#magnetohydrodynamicismhd">
  <skos:prefLabel>Magnetohydrodynamics (MHD)</skos:prefLabel>
  <skos:inScheme rdf:resource="ivo://ivoa/VOcabulary/AAkeys"/>
  <skos:broader
rdf:resource="ivo://ivoa/VOcabulary/AAkeys#physicaldataandprocesses"/>
  <skos:definition>Magnetohydrodynamics</skos:definition>
  <skos:altLabel>MHD</skos:altLabel>
</skos:Concept>
```

Viewing Vocabularies (1)

The screenshot displays the SKOS browser interface for the vocabulary 'obs.proposal'. It is divided into four main panels:

- SKOS Hierarchy: obs.proposal**: A tree view on the left showing the hierarchy. The 'obs' node is expanded, and 'obs.proposal' is selected. Other visible nodes include 'meta', 'stat', 'phys', 'obs.calib', 'obs.sequence', 'obs.observer', 'obs.exposure', 'obs.airMass', 'obs.field', 'obs.image', 'obs.param', 'obs.atmos', 'phot', and 'pos'.
- Individual Annotations: obs.proposal**: A panel at the top right with a search bar for 'Annotations' and tabs for 'Individual Annotations' and 'Individual Usage'.
- Description: obs.proposal**: A panel in the bottom middle showing the 'Types' section with 'Concept' selected. It also includes sections for 'Same individuals' and 'Different individuals'.
- Property assertions: obs.proposal**: A panel on the bottom right showing 'Object property assertions' with 'inScheme' and 'broader obs', and 'Data property assertions' with 'definition "Observation proposal"' and 'prefLabel "obs.proposal"'. It also has sections for 'Negative object property assertions' and 'Negative data property assertions'.

Viewing Vocabularies (2)

The screenshot displays the SKOS (Simple Knowledge Organization System) interface, showing a hierarchy of concepts and their associated annotations and property assertions.

SKOS Hierarchy: Anonymous : [Collection]

- Techniques: radial velocities
- Astrometry and celestial mechanics
- Stars: kinematics
- Galaxies: nuclei
- X-rays: diffuse background
- ISM: lines and bands
- Instrumentation: adaptive optics
- ISM: atoms
- Stars: formation
- (Stars:) supernovae: general
- Instrumentation: miscellaneous
- Sun: UV radiation
- Radiation mechanisms: non-thermal
- Stars
 - Anonymous : [Collection]**
 - galaxiesclusters
 - Radio lines: stars
 - Sun: radio radiation
 - Galaxy: structure
 - Ultraviolet: ISM
 - Stars: chromospheres
 - ISM: general

Individual Annotations: Anonymous : [Collection]

Annotations +

label

"Stars"

Individual Annotations Individual Usage

Description: Anonymous : [Collection]

Types +

Collection

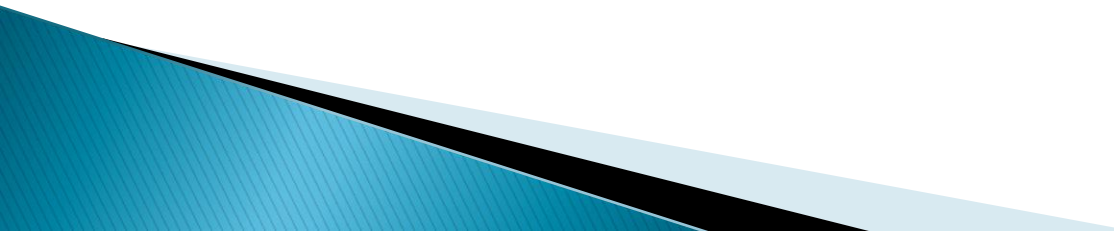
Same individuals +

Different individuals +

Property assertions: Anonymous : [Collection]

- member Stars: chromospheres
- member Stars: luminosity function, maximum
- member Stars: statistics
- member Stars: Population II
- broader Stars
- member (Stars:) Hertzsprung-Russell and C-M diagrams
- member Stars: AGB and post-AGB
- member Stars: atmospheres
- member (Stars:) subdwarfs
- member Stars: emission-line, Be
- member starsvariables
- member (Stars:) sunnariante

Astronomy Exploration Service

- ▶ Given a term in a vocabulary find
 - Broader terms
 - Narrower terms
 - Related terms
 - ▶ User should not need to know
 - Mappings between vocabularies
 - SPARQL
 - ▶ Allow the user to “explore” the results
- 

Retrieving Broader Terms

- ▶ Find all items that are more general than a AOIM variable nova

```
select ?bURI ?bName
```

```
where { AOIM:startypevariablenova rdfs:subClassOf ?r .
```

```
      ?r skos:broader ?bURI .
```

```
      ?bURI skos:prefLabel ?bName .}
```

- ▶ Using AAk and AOIM returns:

?bURI	?bName
AOIM:startypevariable	Star: Type: Variable
AAk:stars	Stars

Semantic Web Navigation (1)

BBC NEWS | World | Africa | Namibia suffers polio 'setback'

http://news.bbc.co.uk/1/hi/world/africa/5053370.stm

Home Page Dictionary Zargan Seslisozluk KWeb Google Scholar Google Power Turk Hoppers@KWeb W4A ASSETS2006-DC

BBC NEWS | World | Africa | Nami... BBC NEWS | World | Africa | Nami...

bbc.co.uk Home TV Radio Talk Where I Live A-Z Index Search

UK version International version About the versions Low graphics Accessibility help

BBC NEWS **BBC News in video and audio** **News services** Your news when you want it

News Front Page World

Africa Americas Asia-Pacific Europe Middle East South Asia UK England Northern Ireland Scotland Wales Business Politics Health Education Science/Nature Technology Entertainment

Last Updated: Tuesday, 6 June 2006, 16:55 GMT 17:55 UK

E-mail this to a friend Printable version

Namibia suffers polio 'setback'

By Frauke Jensen
BBC News, Windhoek

Namibia has announced that the country is suffering from its first polio outbreak in more than a decade.



Since 1990, children have been vaccinated against polio

"It is quite a setback for us. We were moving closer to achieving the status of polio eradication," health ministry official Dr Kalumbi Shangula said.

He said as most victims were aged over 20 they had missed out on under-five vaccination campaigns carried out since 1990, when Namibia gained independence.

Seven people have died and 27 others have been paralysed since mid-May.

Investigations into whether the outbreak was due to faeces

SEE ALSO:

- Polio spread halted across Africa 10 Nov 05 | Africa
- Q&A: Polio 31 May 05 | Medical notes
- UN launches key anti-polio push 08 Oct 04 | Africa
- Nigeria spearheads polio campaign 02 Oct 04 | Africa
- Africa 'faces new polio threat' 24 Aug 04 | Health
- Polio epidemic warning for Africa 22 Jun 04 | Health
- Polio 'to die out by end of year' 03 Aug 04 | Health

RELATED INTERNET LINKS:

- World Health Organization
- Global Polio Eradication Initiative

The BBC is not responsible for the content of external internet sites

TOP AFRICA STORIES

Find: polio vil Find Next Find Previous Highlight all Match case Phrase not found

Done Open Notebook

Semantic Web Navigation (2)

The screenshot shows a web browser window with the address bar displaying `http://localhost:8084/cohse/kain/http://news.bbc.co.uk/1/hi/world/africa/505337`. The page is a BBC News article titled "Namibia suffers polio 'setback'". A semantic web overlay is visible, showing a hierarchy of categories: "Polio (Polio Virus)" is the main category, with sub-categories like "Species of Enterovirus causing acute infection in humans and leading to nervous system damage in a minority of cases. Humans are the only natural, but infection can also occur in non-human primates and experimentally in rodents." and "Broader Resources". The "Broader Resources" section lists links to Wikipedia, Department of Health information, and various news updates. The article text on the page includes: "Namibia has the country is its first polio more than a", "It is quite a s", "We were mov", "achieving the", "eradication," h", "official Dr Kal", "said.", "He said as mo", "out on under-f", "1990, when N", "Seven people", "since mid-May", "Investigations", "infested water", "in from outside are still not conclusive.", "Preliminary results indicate a polio virus 1 Wild Type," "Permanent Health Secretary Dr Shangula said". The browser's address bar shows the URL `http://localhost:8084/cohse/kain/http://news.bbc.co.uk/1/hi/world/africa/505337`. The page title is "BBC NEWS | World | Africa | Namibia suffers polio 'setback'". The browser's address bar shows the URL `http://localhost:8084/cohse/kain/http://news.bbc.co.uk/1/hi/world/africa/505337`. The page title is "BBC NEWS | World | Africa | Namibia suffers polio 'setback'". The browser's address bar shows the URL `http://localhost:8084/cohse/kain/http://news.bbc.co.uk/1/hi/world/africa/505337`. The page title is "BBC NEWS | World | Africa | Namibia suffers polio 'setback'".

Semantic Web Navigation (3)

Department of Health information on Polio

http://localhost:8084/cohse/kain/http://www.neli.org.uk/IntegratedCRD.nsf/f3634a4f

Home Page Dictionary Zargan Seslisozluk KWeb Google Scholar Google Power Turk Hoppers@KWeb W4A ASSETS2006-DC

NeLI National electronic Library of Infection (NeLI) **NHS**

Home Browse Clinical Presentation Organisms Diseases Systems Useful Resources Search

Review

Add Reviewers Assessment

Resource Details

Title	Department of Health information on Polio
Link	http://www.dh.gov.uk/PolicyAndGuidance/HealthAndSocialCareTopics/Polio/fs/en
Author(s)	DH
Abstract	Polio, or poliomyelitis , is an acute illness brought on when one of three types of polio virus (1, 2, and 3) invades the gastro-intestinal tract. The virus has an affinity for nervous tissue , and can cause paralysis if it reaches the central nervous system . Its incubation period is 3-21 days. Routine immunisation was introduced in 1956, but people born before 1958 may not have been immunised. However, since the launch of the Global Polio Eradication Initiative in 1988, the virus is circulating in only seven countries: Afghanistan, Egypt, India, Niger, Nigeria, Pakistan and Somalia.
Publisher Source	This site provides links to key publications and useful links. Department of Health (DH) Department of Health (DH)

Find: span Find Next Find Previous Highlight all Match case

Done

Open Notebook

Future Work

- ▶ Develop service for seamless astronomical vocabulary exploration
 - ▶ Explore IR techniques using vocabularies
 - Generate indexes based on vocabularies
 - Use vocabularies for query expansion
 - Result ranking based on vocabularies
 - ▶ Develop Terrier module for vocabularies?
- 