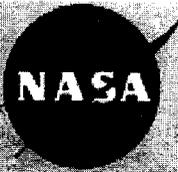




**JPL**

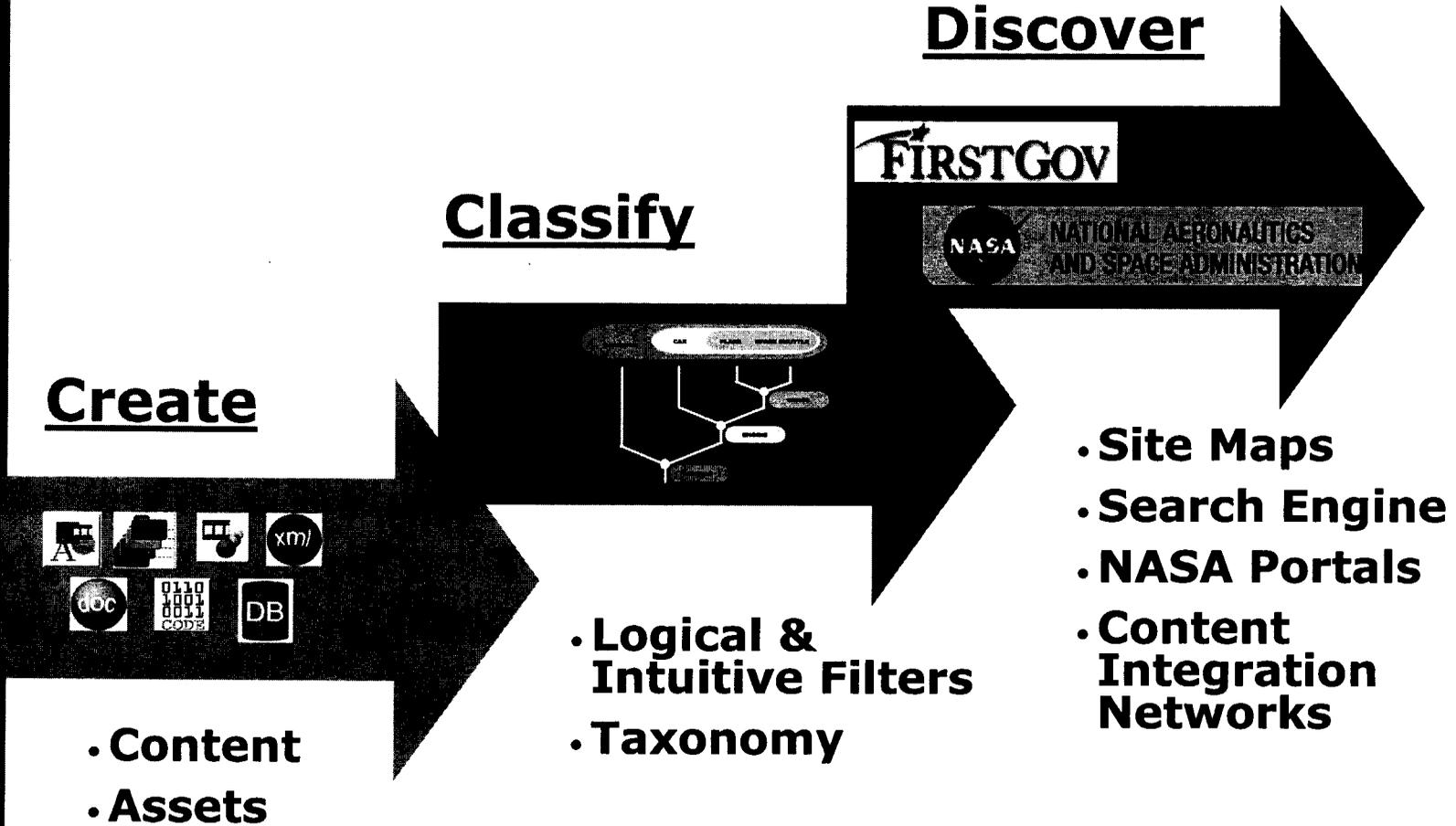
# **NASA Taxonomy 2.0 Project Overview**

*Jayne Dutra, Jet Propulsion Laboratory,  
California Institute of Technology, NASA  
KM Gov Semantics and Taxonomies SIG  
March 8, 2004*



# Purpose of the NASA Taxonomy

**JPL**



**Finding the right information at the right time to solve the problem at hand**



# Project Benefits: Enable Knowledge Discovery

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- Make it easy for various audiences to find relevant information from NASA programs quickly
  - Provide easy access for NASA resources found on the Web
  - Share knowledge by enabling users to easily find links to databases and tools
  - Provide search results targeted to user interests
  - Enable the ability to move content through the enterprise to where it is needed most
- Comply with E-Government Act of 2002
- Be a leading participant in federal XML projects

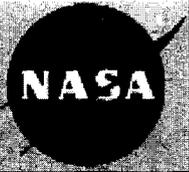


# Project Benefits: NASA Taxonomy Best Practices

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- Design process that:
  - Incorporates existing federal and industry terminology standards like NASA AFS, NASA CMS, FEA BRM, NAICS, and IEEE LOM
  - Provides a product for the NASA XML namespace registry
  - Complies with metadata standards like Z39.19, ISO 2709, and Dublin Core
- Practices increase interoperability and extensibility

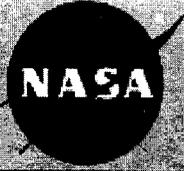


## What is the NASA Taxonomy?

- The classification scheme is meant to encompass all of NASA web content (NASA web space) including internal as well as external material. It is a means for tagging content so it can be used and reused in different contexts.

## How to Use the NASA Taxonomy

- This is a generic taxonomy from which specializations can be derived for specific purposes.
  - **Not all facets need to be used in each instance**
  - **A facet is repeatable**
  - **The taxonomy is modular and dynamic**



# Project Progress: NASA Taxonomy 2.0 Revision Completed



## Follow-on Work

- Integrate with applications

## Phase 4

- Dublin Core mapping
- XML schema development

## Phase 3

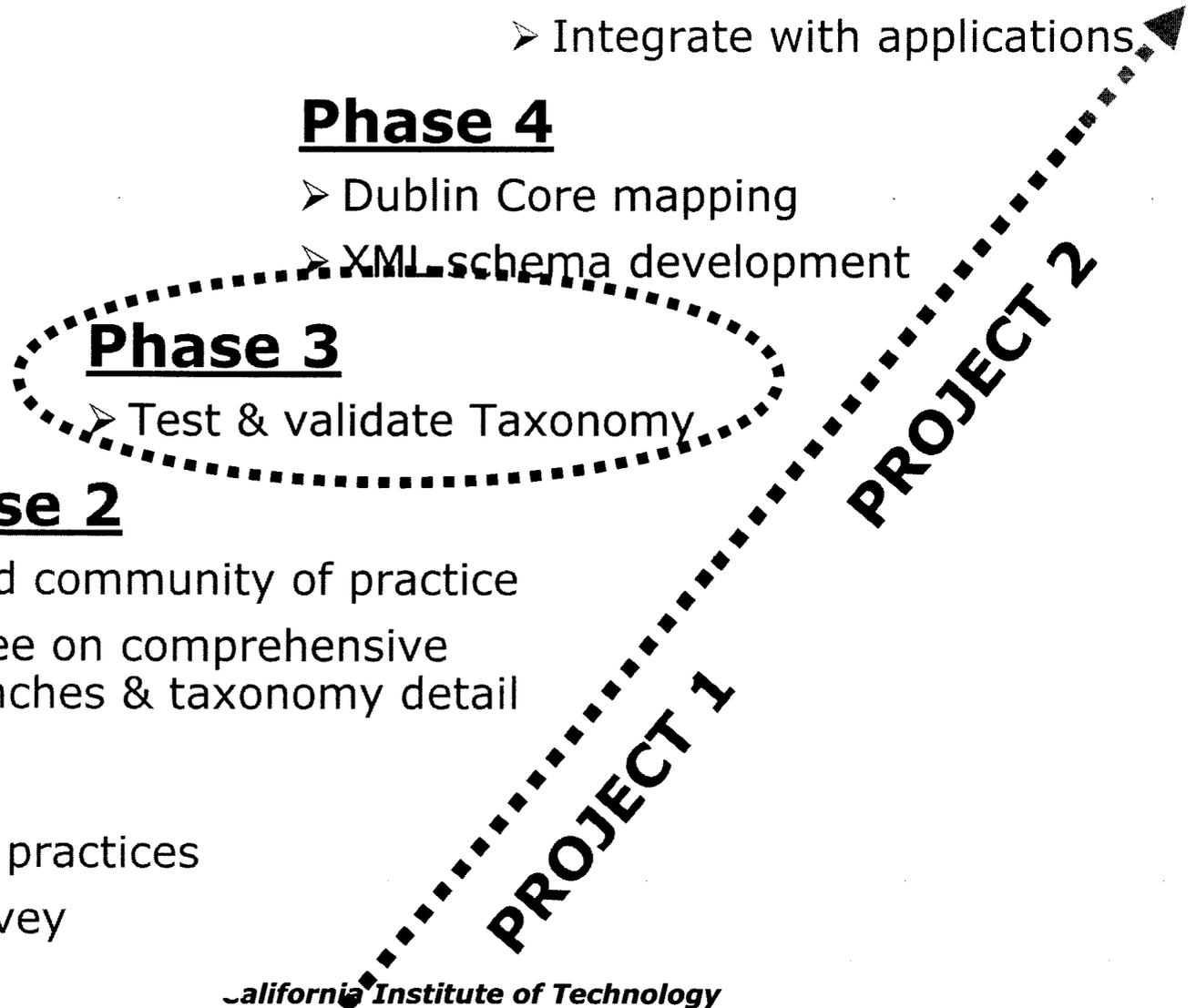
- Test & validate Taxonomy

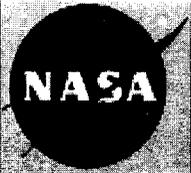
## Phase 2

- Build community of practice
- Agree on comprehensive branches & taxonomy detail

## Phase 1

- Audit Content practices
- Identify & survey stakeholders

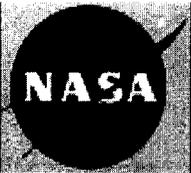




## Objectives of Phases 1-2



- Understand current strategies and practices for creating, collecting, and organizing information across NASA
- Observe how information is used and organized, the audiences for this information, and the information needs of these audiences
- Elicit goals, hopes, and concerns for an information architecture solution
- Start building a community of interest
- Mainly concentrated on content for outreach (NASA portal)



# Key Findings



- Most (70%) NASA content already has some tagging or is categorized.
  - Most (70%) owners add tag content with metadata.
  - Almost half (45%) use a standard metadata schema, but many different standards are used.
  - Most (60%) use a controlled vocabulary, but lots of different controlled vocabularies are used.
- Different NASA constituencies care deeply about what schemas are specified, and what vocabularies are used because ...



# Audience Uses Vary Widely



## Admin

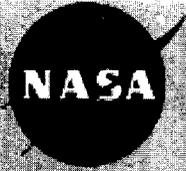
- Better understand the program in total, and obtain scheduling information, project status and best practices.
- Access procurement rules and examples, and procurement action synopses.

## Sci Tech

- Engineering specifications.
- Scholarly research, competitive intelligence, and general aerospace research.

## Public

- Develop educational products, support current products, learn, etc.
- Topic research and fact finding, topic background research, and downloading curriculum support materials.
- In the classroom as stand alone items, hands-on learning opportunities, class projects, to expand on a student's learning potential.
- Find NASA contact information on services, information about student opportunities, information about career opportunities, and latest educational news.



## Test and Validation Phase

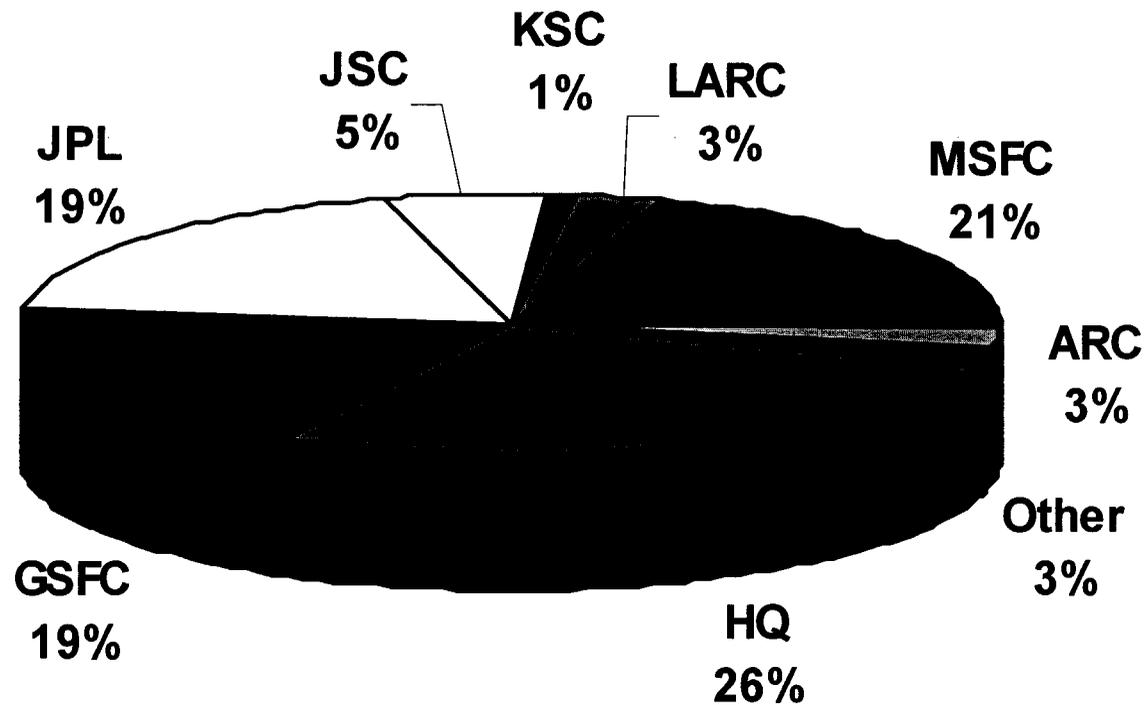
- Qualitative validation
  - Confirm stakeholders and communities
  - Focus on Projects, Engineering & Science
- Quantitative validation
  - Select and build test collection
  - Stratify automated categorizer – Ames support
- Extend taxonomy value space as needed
- Review results with stakeholders and report to CIO Council



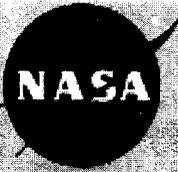
# Engaged Cross-Section of NASA Community



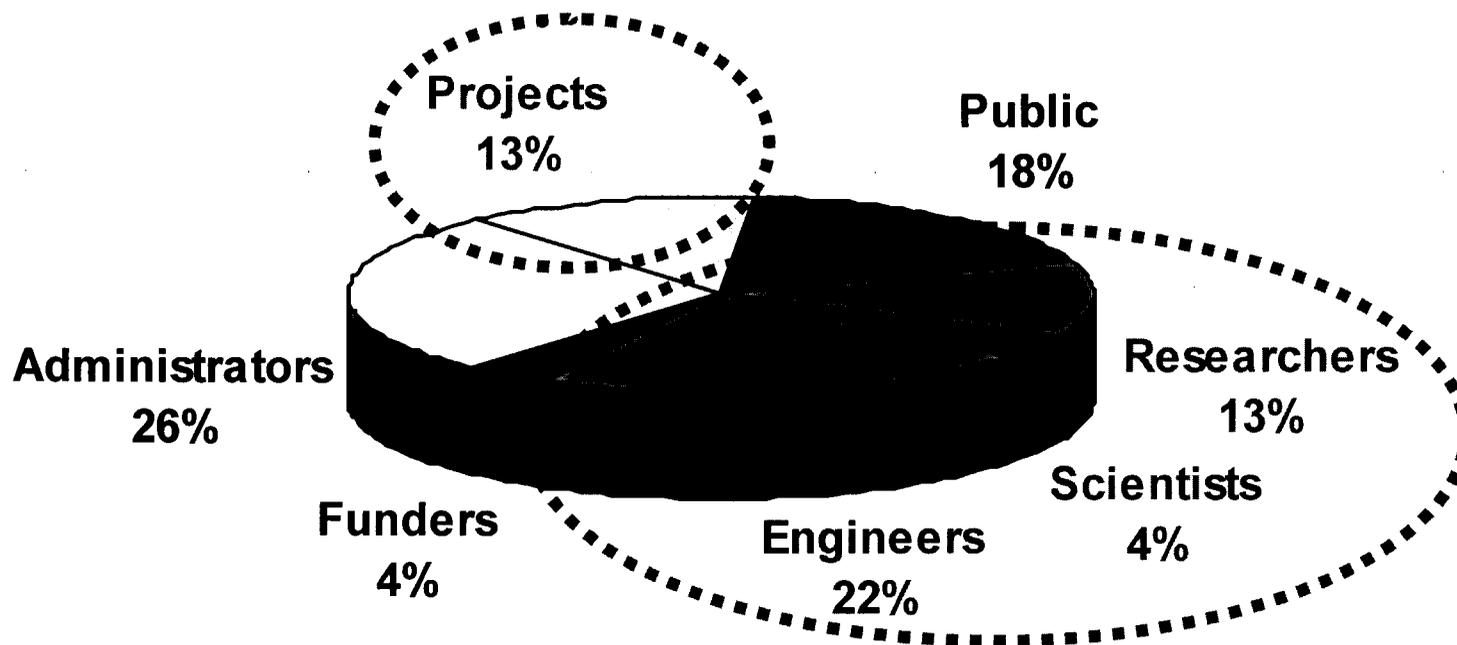
78 interviews across the Agency



... by location

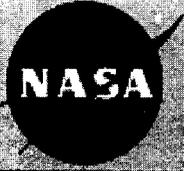


# Focused on Projects, Engineering & Science



... by primary audience served.

**52%—Projects, Engineering & Science**



# Extend Taxonomy Value Space as Needed



## NASA Taxonomy Facets (Top Level)

- Access Requirements (*new*)
  - Audiences
  - Business Purpose (*formerly Functions*)
  - Competencies (*formerly Disciplines*)
  - Content Types (*formerly Information*)
  - Industries
  - Instruments (*new*)
  - Locations
  - Missions and Projects
  - Organizations
  - Subject Categories (*new*)
- 
- Dates (*formerly Chronology*)
  - Collections

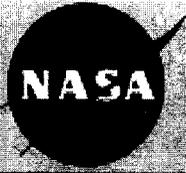
- 
- [http://eis.jpl.nasa.gov/~jedutra/NASA\\_Taxonomy\\_04/index.htm](http://eis.jpl.nasa.gov/~jedutra/NASA_Taxonomy_04/index.htm)



# Taxonomy Depth and Breadth



Facets	# Terms	# Levels Deep
Access Requirements	5	2
Audiences	62	6
Business Purpose	96	4
Competencies	169	4
Content Types	96	4
Industries	22	3
Instruments	56	3
Locations	106	8
Missions/Projects	648	6
Organizations	323	6
Subject Categories	78	3
Total	1661	



## • Content Types

- . Announcements
- .. Press Kits
- .. Press Releases
- . Articles, Notes, and Papers
- . Calendars and Schedules
- .. Agendas
- . Case Studies
- . Catalogs and Databases
- . Correspondence
- .. e-Mails
- .. Memos
- . Databases
- .. Bibliographic Databases
- .. Image Databases
- . Designs and Specifications
- .. Configuration Controls
- .. Notebooks
- .. Quality Control
- .. Requirements
- . Drawings
- . Educational Materials
- .. Activity Guides
- .. Educational Toys
- .. Educator's Guides

### Configuration Controls

**Broader Terms:**

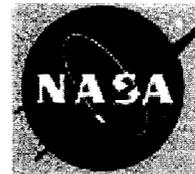
Designs and Specifications

**Scope Note:**

Records of changes to documentation or hardware, including engineering change requests and waivers.

**Term Number:**

52



## NASA Taxonomy



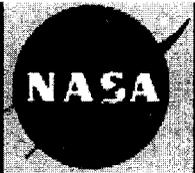
- Query link into FirstGov
- Quick access to Google
- A-Z index of facet branch
- Easy navigation to top level facet and term index



# Selected and Built Test Collection



<b>Collection</b>	<b>Source URL</b>	<b>No of Docs</b>
<u>Lessons Learned Database</u>	<a href="http://llis.nasa.gov">http://llis.nasa.gov</a>	1,370
<u>NTRS</u> (NASA Technical report Server)	<a href="http://ntrs.nasa.gov">http://ntrs.nasa.gov</a>	213,900
<u>SIRTF</u> (Space Infrared Telescope Facility) Project Library	<a href="http://sirtifweb.jpl.nasa.gov">http://sirtifweb.jpl.nasa.gov</a>	4,054
James <u>Webb</u> Space Telescope (JWST) Project Documents	<a href="http://ngst.gsfc.nasa.gov/doclist/bytitle.html">http://ngst.gsfc.nasa.gov/doclist/bytitle.html</a>	634



# Built Demonstration of Taxonomy Value in Search and Navigation



NATIONAL AERONAUTICS  
AND SPACE ADMINISTRATION

Search

219958 items

### by Organization

[NASA Affiliated Institutions](#) 1378  
[NASA Centers](#) 76545  
[NASA Contractors](#) 10108  
[NASA Enterprises](#) 815  
[NASA Headquarters](#) 4042  
[Other NASA Partners](#) 999

### by Competencies

[Business](#) 386  
[Engineering](#) 393  
[Mission](#) 555  
[Scientific](#) 410  
[Technical](#) 218

### by Subject

[Aeronautics](#) 26532  
[Astronautics](#) 31758  
[Chemistry and Materials](#) 17086  
[Engineering](#) 39631  
[Geosciences](#) 30770  
[Mathematical and Computer Sciences](#) 13286  
[Space Sciences](#) 22685  
[4 more](#)

### by Information Type

[Catalogs and Databases](#) 32  
[Designs and Specifications](#) 62  
[Plans and Agendas](#) 158  
[Results and Analyses](#) 260  
[Reviews and Lessons Learned](#) 1819  
[Status Reports](#) 119  
[Technical Reports](#) 229  
[6 more](#)

### by Missions and Projects

[Aerospace Technology](#) 60  
[Biological and Physical Research](#) 68  
[Data](#) 140  
[Earth Sciences](#) 1497  
[Human Exploration and Development...](#) 10680  
[Planetary Missions](#) 4819  
[Space Sciences](#) 9467

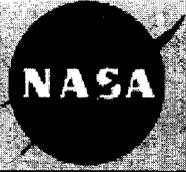
### by Collection

[Lessons Learned](#) 1370  
[NTRS](#) 213900  
[SIRTF](#) 4054  
[Webb](#) 634

### by Date

[1972](#) 8392  
[1973](#) 8512  
[1974](#) 7828  
[1975](#) 7704  
[1992](#) 8131  
[1993](#) 8519  
[1994](#) 7712  
[74 more](#)

...that provides common access framework across test collections



# Search on "rover" Returns 595 Matches ...Organized by Taxonomy



## by Organization

- [NASA Affiliated Institutions](#) 6
- [NASA Centers](#) 304
- [NASA Contractors](#) 18
- [NASA Enterprises](#) 3
- [NASA Headquarters](#) 7
- [Other NASA Partners](#) 14

## by Subject

- [Aeronautics](#) 13
- [Astronautics](#) 109
- [Engineering](#) 106
- [Geosciences](#) 26
- [Life Sciences](#) 31
- [Mathematical and Computer Sciences](#) 65
- [Space Sciences](#) 208
- [4 more](#)

## by Missions and Projects

- [Data](#) 1
- [Earth Sciences](#) 3
- [Human Exploration and Development...](#) 130
- [Planetary Missions](#) 125
- [Space Sciences](#) 7

## by Date

- [1989](#) 37
- [1991](#) 40
- [1992](#) 44
- [1993](#) 44
- [1999](#) 61
- [2000](#) 60
- [2001](#) 40
- [29 more](#)

## by Competencies

- [Business](#) 4
- [Engineering](#) 4
- [Mission](#) 3
- [Scientific](#) 3

## by Information Type

- [Reviews and Lessons Learned](#) 5
- [Status Reports](#) 1
- [Technical Reports](#) 3

## by Collection

- [LessonsLearned](#) 4
- [NTRS 591](#) 



# Taxonomy Enables Discovery of Unknown but Related Content



**5 items matching  
Text contains rover**

**Information Type:  
Reviews and Lessons  
Learned**

**by Organization**

- NASA Centers 5
- NASA Enterprises 3

**by Subject**

- Aeronautics 4
- Astronautics 4
- Chemistry and Materials 1
- Engineering 1
- Mathematical and Computer Sciences 1

**by Date**

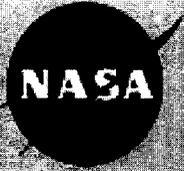
- 1997 1
- 2002 1
- 2003 3

**by Competencies**

- Business 4
- Engineering 4
- Mission 3
- Scientific 3

**by Collection**

- Lessons Learned 4
- NTRS 1



# Search & Browse Demo Site



- <http://tb1.siderean.com:7880/test/test2query3.jsp>

Logon: NASA

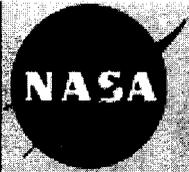
Password: facets

- 
- Hosted by Seamark [www.seamark.com](http://www.seamark.com) with Siderean software



### **Dublin Core Mapping and XML Schema Development**

- Complete Dublin Core mapping
- Create any necessary NASA specific tags
- Develop XML schema from metadata
- Review results with stakeholders and report to CIO Council
- Register schemas in NASA XML Registry
- Educate and train publishing communities



# NASA Taxonomy – Dublin Core Map (Draft)



<b>Dublin Core Elements</b>	<b>Definition</b>	<b>NASA Taxonomy Mapping</b>
<b>Creator</b>	<b>Content maker.</b>	dc:creator dc:creator.employee dc:creator.organization
<b>Subject</b>	<b>Content topic.</b>	dc.subject.organization dc.subject.missionsProjects dc.subject.disciplines
<b>Publisher</b>	<b>Publisher of this manifestation.</b>	dc:publisher.organization
<b>Contributor</b>	<b>Content contributor.</b>	dc:contributor dc:contributor.employee dc:contributor.organization
<b>Type</b>	<b>Genre.</b>	dc:type.information
<b>Coverage</b>	<b>Space, period, date, jurisdiction, etc.</b>	dc:coverage.locations dc:coverage.chronology
<b>Audience</b>	<b>Content audience.</b>	dcTERM:audience
<b>Non DC</b>	<b>NASA missions and projects.</b>	nasa:missionsProjects
<b>Non DC</b>	<b>Business functions.</b>	nasa:functions
<b>Non DC</b>	<b>Technical specialties.</b>	nasa:disciplines
<b>Non DC</b>	<b>Standard industry categories.</b>	naics:industries

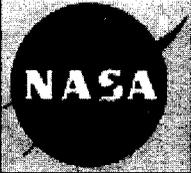


# Project Outcomes: NASA Taxonomy Benefits



## ... at the NASA Level

- Metadata specification for all NASA content publishers
- XML schema registered in accordance with agreed standards (to enable appropriate use and reuse)
- Enhancement of Agency Web publishing processes
- Integration with NASA public portal content management system for:
  - Reduced publishing cycles
  - Better quality of Web materials – coordinated themes
- Integration with NASA Search Engine, Web Site Registration System
- Application in many technical areas, including engineering and science disciplines (STEP and science data dictionaries)

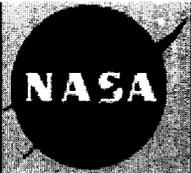


# Project Outcomes: NASA Taxonomy Benefits



## ... at the Federal Level

- NASA taxonomy development in accordance with e-Gov Act of 2002
- Integration with FEA at the BRM & DRM level
- Increased interoperability with other federal agencies through common data models and standards
- Better interoperability with industry partners for increased speed of mission development
- Enhanced results in First Gov search engine
- Readiness to actively participate in e-Gov initiatives



# Taxonomy Follow-on Work



- Taxonomy stewardship
  - Maintenance, education and training
  - Facilitate standard adoption process
- Apply in public and internal portals
  - DM, PM, CM, and DAM tagging
  - Search integration
    - Verity K2
    - Faceted search and navigation
  - content integration networks for real time delivery
- Implement in website registration system
- Participate in NASA Enterprise Architecture Group standards development
  - Web Services infrastructure: Agency UDDI, RSS specifications, directory capability

- CIO presentation
- Define review and approval process
- Facilitate review and approval process
- Deliver metadata specification
- Formalize taxonomy as XML schema
- Delegate taxonomy ownership
  - Within Code V
- Plan follow-on work – phased implementation



# White Papers and Supporting Documentation



- NASA Taxonomy Ver. 2.0, Presentation, Dutra 3/8/04 (*this presentation*)
  - [https://pub-lib.jpl.nasa.gov/pub-lib/dscgi/ds.py/Get/File-120/NASA\\_Taxonomy\\_KM\\_Gov.ppt](https://pub-lib.jpl.nasa.gov/pub-lib/dscgi/ds.py/Get/File-120/NASA_Taxonomy_KM_Gov.ppt)
- White Paper: Taxonomy Development With NASA, Dutra and Busch, 2003
  - [https://pub-lib.jpl.nasa.gov/pub-lib/dscgi/ds.py/Get/File-22/NASA\\_Taxonomy\\_Overview-0203.ppt](https://pub-lib.jpl.nasa.gov/pub-lib/dscgi/ds.py/Get/File-22/NASA_Taxonomy_Overview-0203.ppt)
- White Paper: Implementing the NASA Taxonomy Through Service Oriented Architectures, Dutra and Xiao, 2/2004
  - [https://pub-lib.jpl.nasa.gov/pub-lib/dscgi/ds.py/Get/File-118/Content\\_Integration\\_Networks\\_WP\\_02\\_04\\_04.doc](https://pub-lib.jpl.nasa.gov/pub-lib/dscgi/ds.py/Get/File-118/Content_Integration_Networks_WP_02_04_04.doc)

**Thanks for your time!**

Jayne.E.Dutra@jpl.nasa.gov



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# **Taxonomy Tagging**

Examples

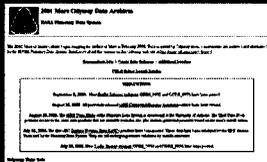


# 2001 Mars Odyssey Data Archives



## Taxonomy Example

<http://wufs.wustl.edu/missions/odyssey/#Odyssey%20Data%20Sets>



Attribute	Values
<b>Content Types</b>	Data Files; Web Sites
<b>Audiences</b>	Researchers; Scientists
<b>Organizations</b>	Jet Propulsion Laboratory
<b>Missions and Projects</b>	Mars Odyssey
<b>Industries</b>	N/A
<b>Locations</b>	Mars
<b>Business Purpose</b>	Scientific and Technical Information
<b>Competencies</b>	Planetary and Lunar Science
<b>Dates</b>	2002-present



# Clementine - DSPSE



## Taxonomy Example

<http://www.cmf.nrl.navy.mil/clementine/>

Attribute	Values
<b>Content Types</b>	Web Sites; Data Files; Images
<b>Audiences</b>	Researchers; Scientists; Educators; Students
<b>Organizations</b>	Naval Research Laboratory
<b>Missions and Projects</b>	Clementine
<b>Industries</b>	N/A
<b>Locations</b>	The Moon
<b>Business Purpose</b>	Scientific and Technical Information
<b>Competencies</b>	Planetary and Lunar Science
<b>Dates</b>	1994



# Jupiter's Ring System



## Taxonomy Example

<http://ringmaster.arc.nasa.gov/jupiter/jupiter.html#index>



Attribute	Values
<b>Content Types</b>	Web Sites; Animations; Images; Reference Sources
<b>Audiences</b>	Educators; Students
<b>Organizations</b>	Ames Research Center
<b>Missions and Projects</b>	Voyager; Galileo; Cassini; Hubble Space Telescope
<b>Industries</b>	N/A
<b>Locations</b>	Jupiter
<b>Business Purpose</b>	Scientific and Technical Information
<b>Competencies</b>	Planetary and Lunar Science
<b>Dates</b>	1979-1999