MetaSat
Metadata for Good
Daina Bouquin

I’m a librarian

Harvard University **+** Smithsonian Institution

- arXiv
- AAS Unified Astronomy Thesaurus
- Software Preservation Network
- Mozilla Foundation

MS Data Analytics

+

MS Library & Information Science

metadata for small satellites

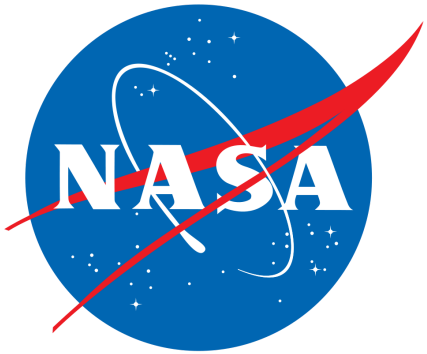
Alfred P. Sloan FOUNDATION

Funding MetaSat

CENTER FOR ASTROPHYSICS
HARVARD & SMITHSONIAN

Early adopters and collaborators

Libre Space Foundation



Space Act Agreement in progress

Semantics

The relationships between signifiers
and what they stand for in reality.

How we understand what something means.

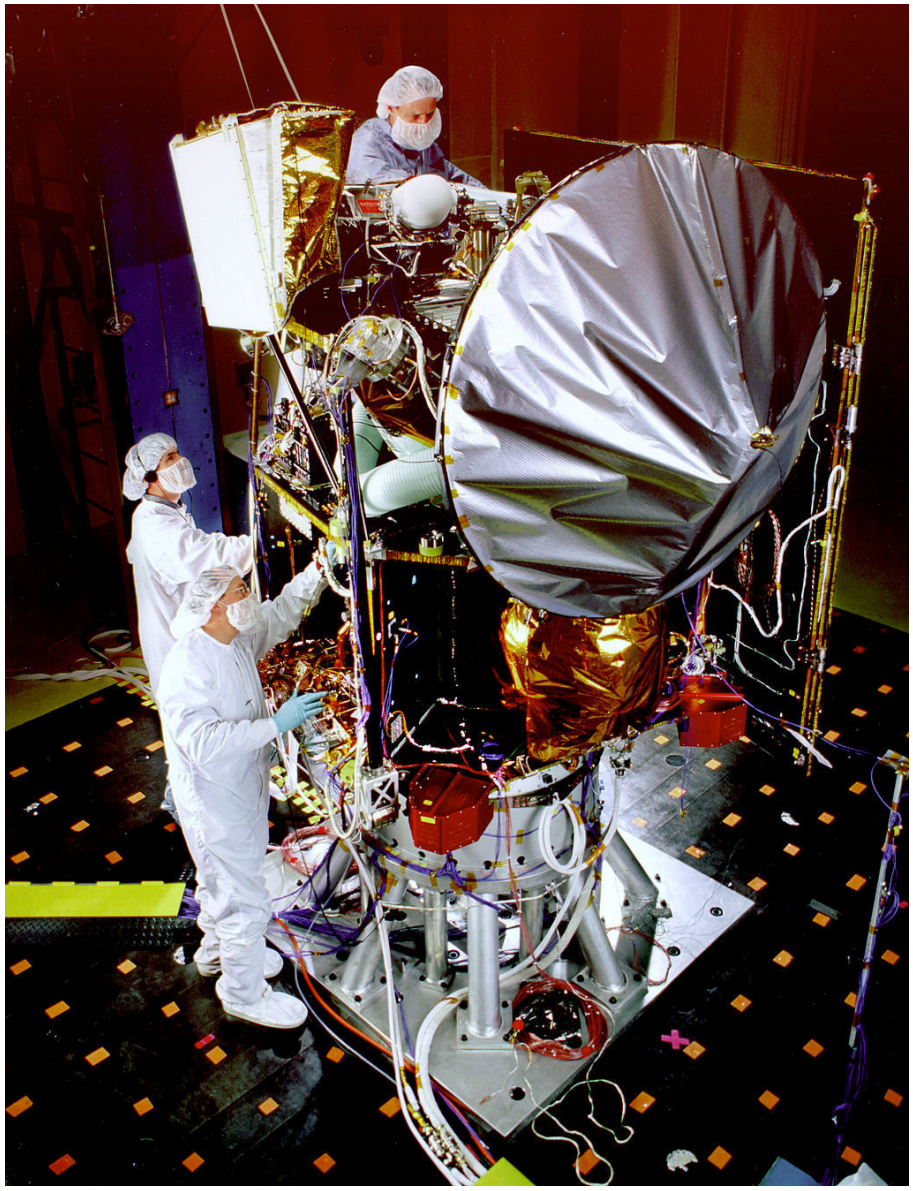
Lexicon

Vocabulary of a person, language, or branch of knowledge.

(contains the signifiers)

Mission

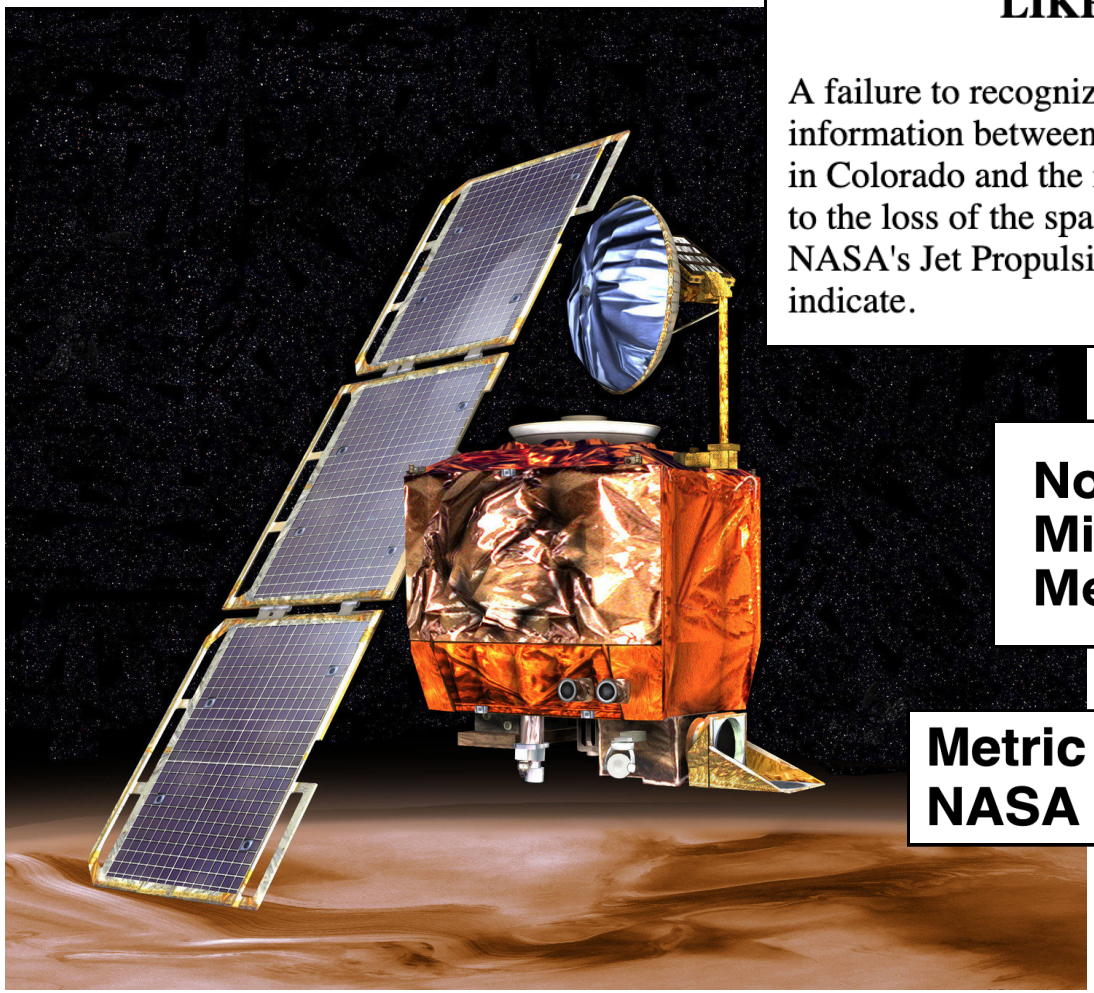
1. an important, complex assignment.
2. a strongly felt aim, ambition, or calling.
3. a body of people who perform a service.



Sometimes all three

- an important assignment
- a strongly felt aim, ambition, or calling.
- a body of people who perform a service.

Mars Climate Orbiter undergoing acoustic testing. (1998). NASA.



RELEASE 99-113

MARS CLIMATE ORBITER TEAM FINDS LIKELY CAUSE OF LOSS

A failure to recognize and correct an error in a transfer of information between the Mars Climate Orbiter spacecraft team in Colorado and the mission navigation team in California led to the loss of the spacecraft last week, preliminary findings by NASA's Jet Propulsion Laboratory internal peer review indicate.

Nov. 10, 1999: Metric Math Mistake Muffed Mars Meteorology Mission

Metric mishap caused loss of NASA orbiter

NASA/JPL/MSSS

September 7, 1999

This is the only image acquired by the Orbiter.

What does this image mean?

Who would I ask?

Will it ever mean something else?

NASA/JPL/MSSS

This image doesn't mean anything on its own.

We need provenance (context).

We need to know the story about the MCO Mission.
We need to know where this image came from.

People need to be able to learn from it.

Metadata

Mechanisms for modeling relationships between the information gathered from provenancial sources.

Schema

Logical framework where
semantic metadata can be recorded.

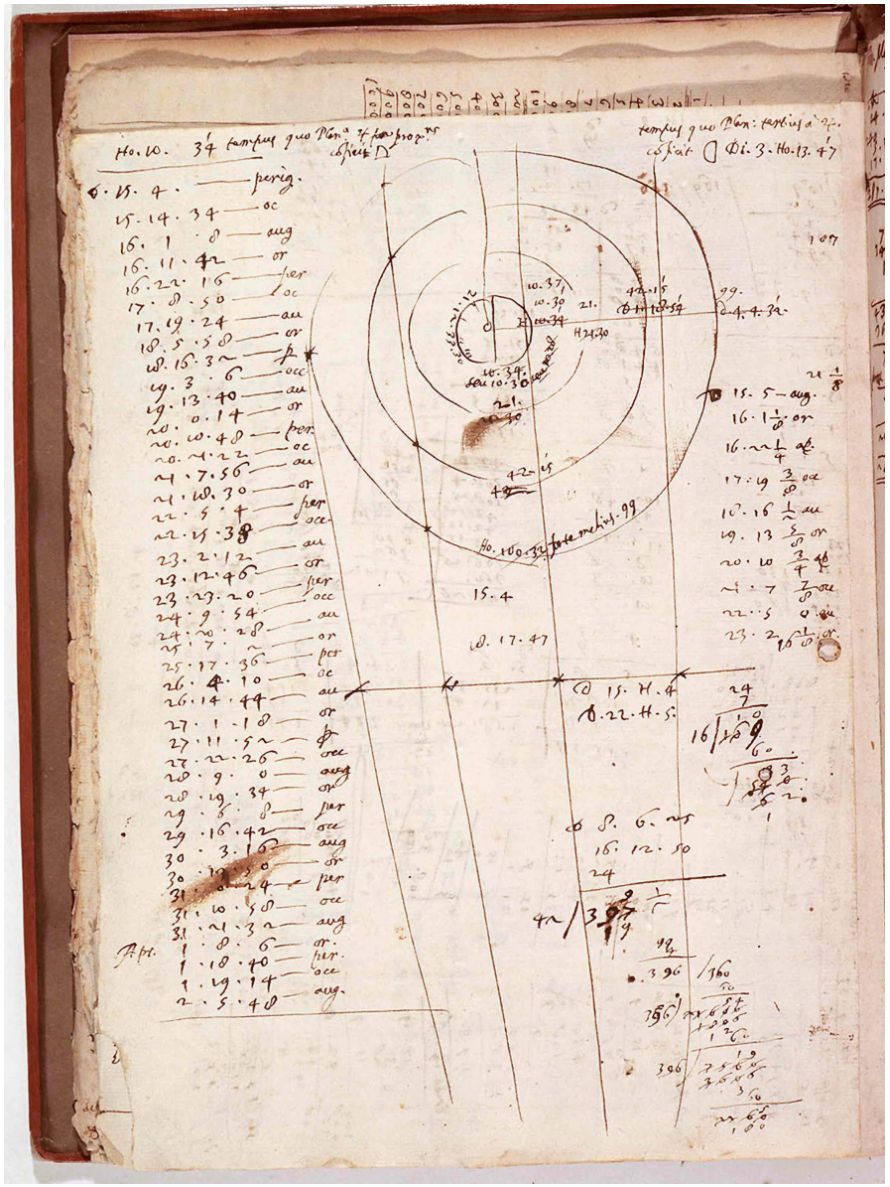
Humphrey, S.D. Multiple Exposures of the Moon: Nine Exposures, daguerreotype, 1849.

Earliest image of the moon.

Was the only image of the moon.

Was a technological innovation that started a scientific revolution.

Now it's art.



Galilei, G. (1610). Osservazioni e calcoli relativi ai Pianeti Medicei.

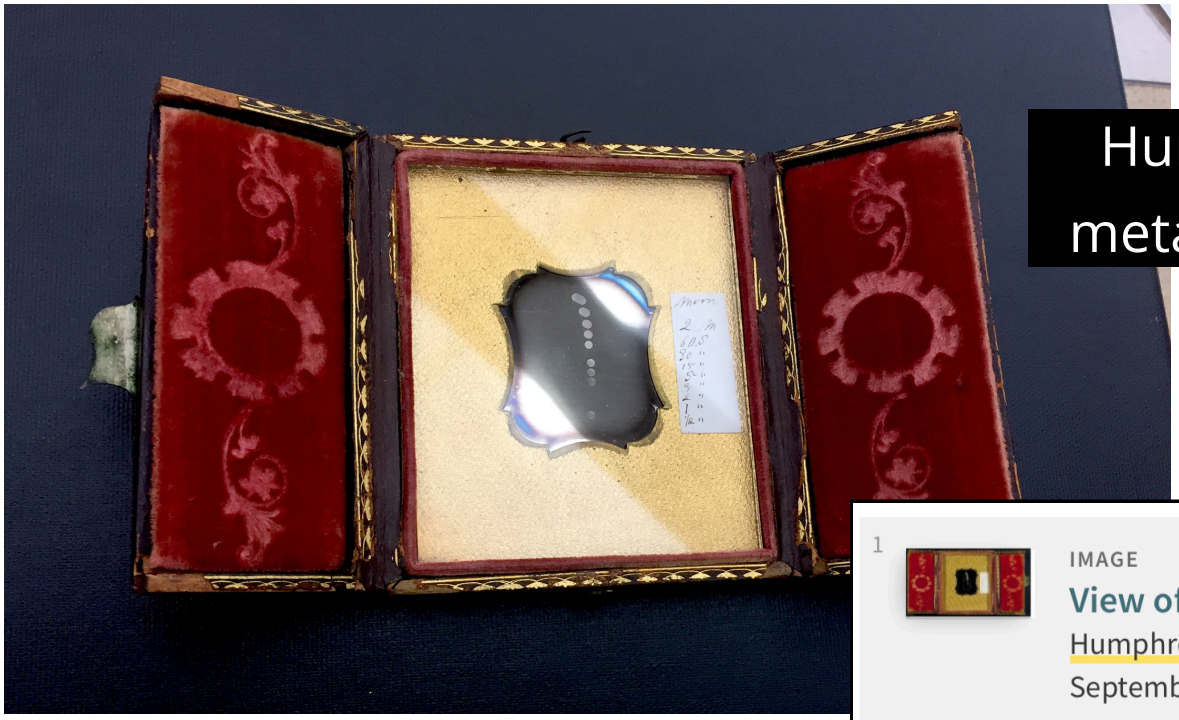
Galileo's notes.

Was chicken scratch.

Now the birth of observational astronomy and the origin of scientific method.

Meaning is collective agreement about a specific thing at a specific time.

Semantic meaning is not static.



Human readable metadata is limited

1

IMAGE

View of the moon, multiple exposures

Humphrey, Samuel Dwight [photographer]

September 1, 1849

VIEW ONLINE >

2

JOURNAL

The Daguerreian journal

New York : S.D. Humphrey

1850-1851.

VIEW ONLINE >

You cannot predict all of the nodes in a semantic network

Title	View of the moon, multiple exposures
Author / Creator	Humphrey, Samuel Dwight [photographer] ›
Description	Multiple exposures of the moon. Nine exposures ranging from 2 minutes to 1/2 second. *Materials/Techniques:* daguerreotype *Dimensions:* sixth plate
Notes	Inscription: Embossed on case: "Daguerreotyp on mat: "Moon 2 M, 60 S., 30 S, 15 S, 5 S, 3 S, 2
Subjects	moon ›
Form / genre	photographs ›
Use restrictions	Harvard College Observatory Library: This image may not be reproduced or transmitted in any form or by any means, electronic or mechanical, without permission in writing from the Harvard College Observatory.
Repository	Harvard College Observatory Library OB-1
Creation Date	September 1, 1849
HOLLIS number	olvwork124646
Permalink	
Source	

Signifiers mean different things to different people.

Absolute agreement is not possible or desirable.

Title	The Daguerreian journal
Published	New York : S.D. Humphrey
Description	*Frequency note:* Semimonthly
Language	English
Notes	Print began with Vol. 1, no. 1 (Nov. 1, 18 Editor: S.D. Humphrey, 1850- "Devoted to the Daguerreian and photo Description based on: Vol. 1, no. 1 (Nov. Latest issue consulted: Vol. 3, no. 3 (Dec
Subjects	Photography -- Periodicals. › Daguerreotype -- Periodicals. ›
Author / Creator	Humphrey, S. D. (Samuel Dwight), 1823-1883. ›
Creation Date	1850-1851.
Source	HVD - Core
Other search terms	Photography ›

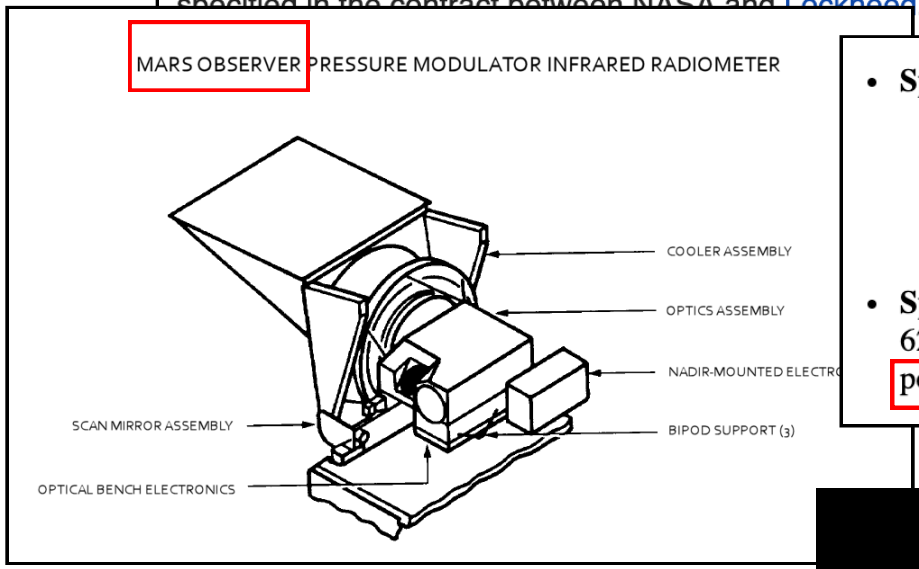
We need to “cross walk” different standards to translate meanings.

Mars Climate Orbiter

From Wikipedia, the free encyclopedia

We need to prevent mission failures

The ***Mars Climate Orbiter*** (formerly the **Mars Surveyor '98 Orbiter**) was a 638-kilogram (1,407 lb)[1] robotic space probe launched by NASA on December 11, 1998 to study the Martian climate, Martian atmosphere, and surface changes and to act as the communications relay in the Mars Surveyor '98 program for Mars Polar Lander. However, on September 23, 1999, communication with the spacecraft was lost as the spacecraft went into orbital insertion, due to ground-based computer software which produced output in non-SI units of pound-force seconds (lbf·s) instead of the SI units of newton-seconds (N·s) specified in the contract between NASA and Lockheed. The spacecraft encountered Mars on a trajectory



The Pressure Modulated Infrared Radiometer (PMIRR)

- **Spacecraft Dimensions**
  - Main bus: 2.1 meters (6.9 feet) tall, 1.6 meters (5.4 feet) wide and 2 meters (6.4 feet) deep.
  - Wingspan of solar array: 5.5 meters (18 feet) tip to tip.
- **Spacecraft Weight**
  629 kg (1,387 pounds) total, consisting of 338 kg (745 pound) spacecraft and 291 kg (642 pounds) fuel.

Meaning needs to be machine actionable

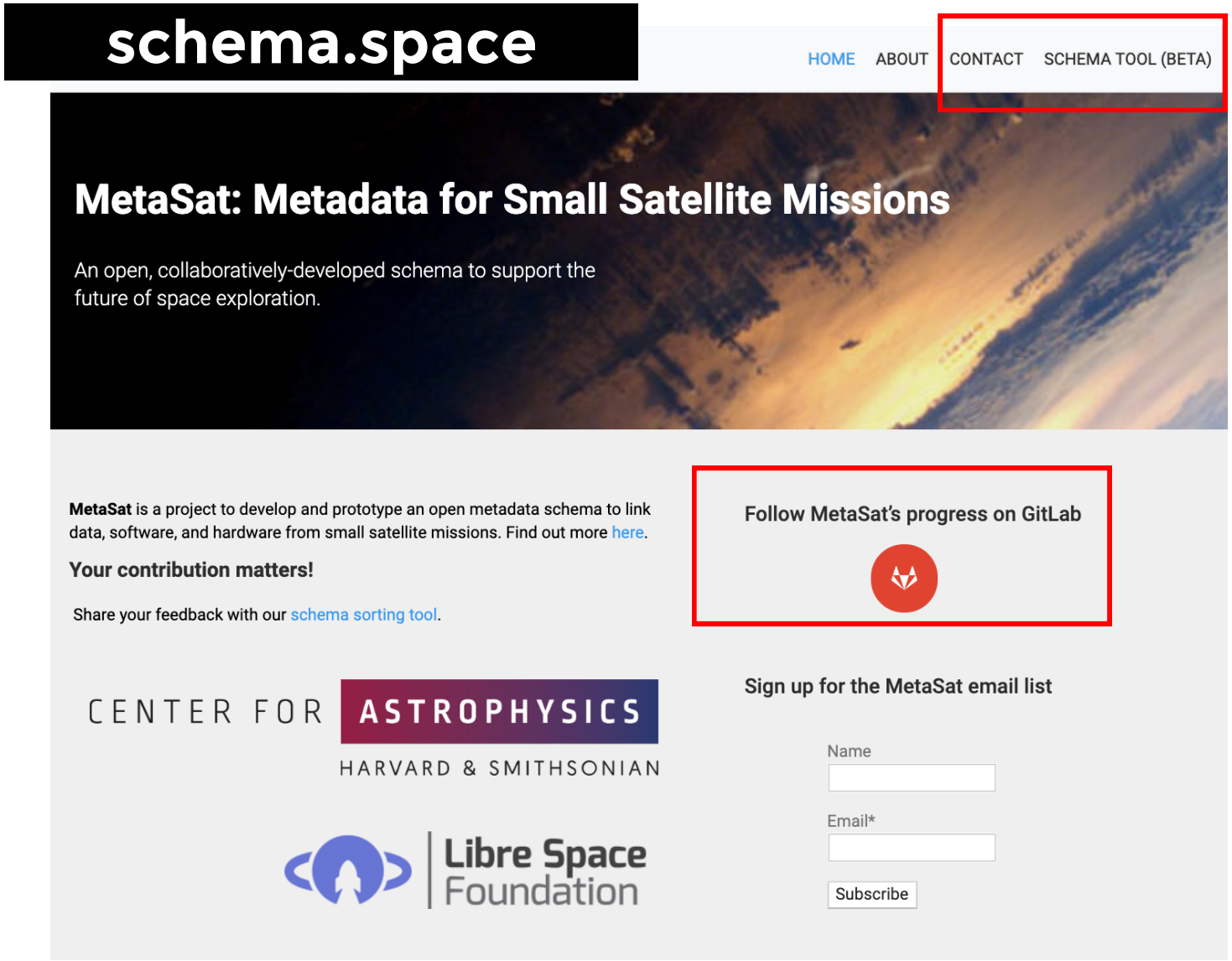
What is the mission?

Why is there a mission?

Who takes the mission on?

We need to be able to describe the components.

Data. Software. Hardware. People.


schema.space
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SCHEMA TOOL (BETA)
MetaSat: Metadata for Small Satellite Missions
An open, collaboratively-developed schema to support the future of space exploration.
MetaSat is a project to develop and prototype an open metadata schema to link data, software, and hardware from small satellite missions. Find out more here.
Your contribution matters!
Share your feedback with our schema sorting tool.
Follow MetaSat's progress on GitLab
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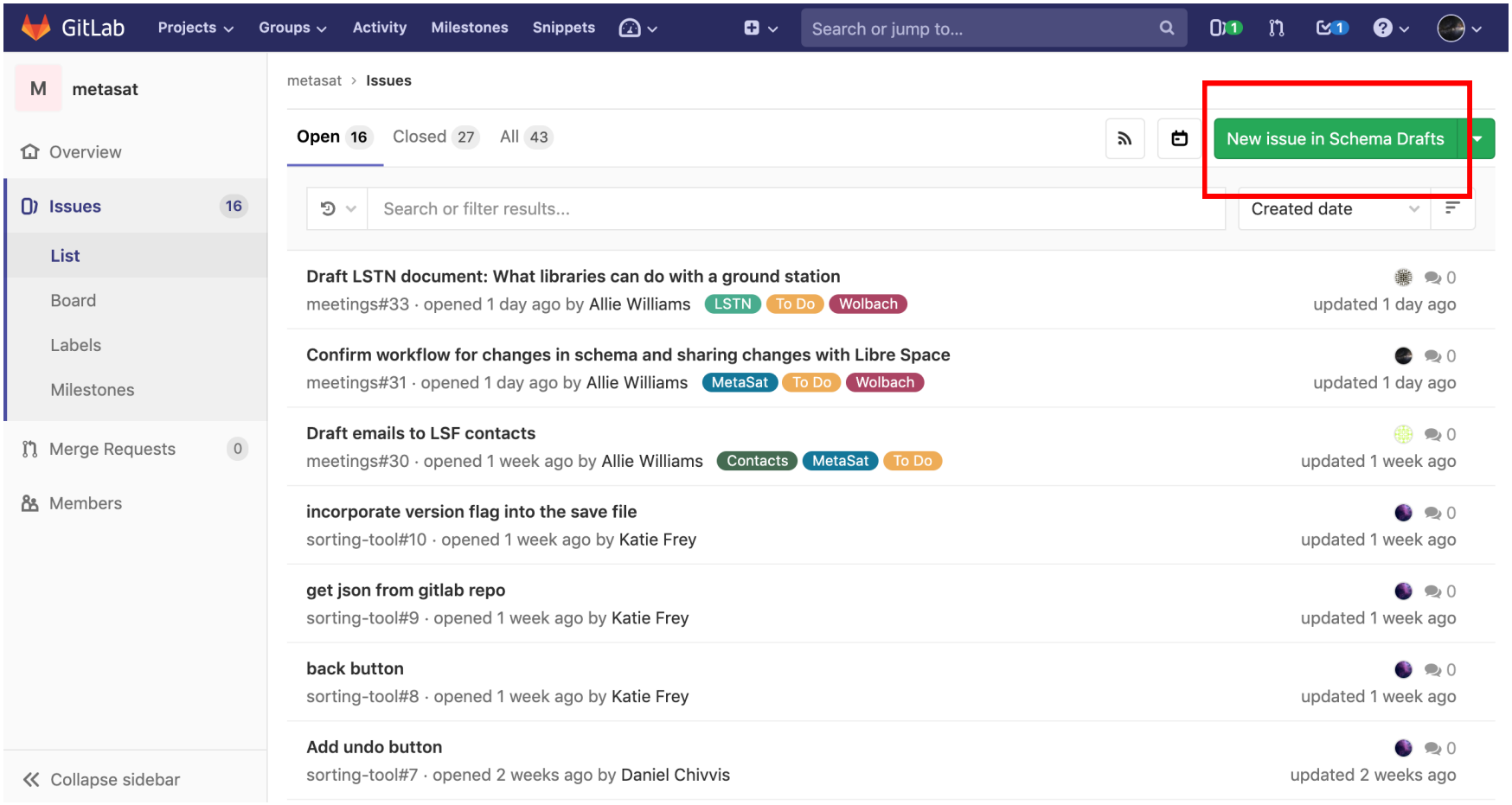
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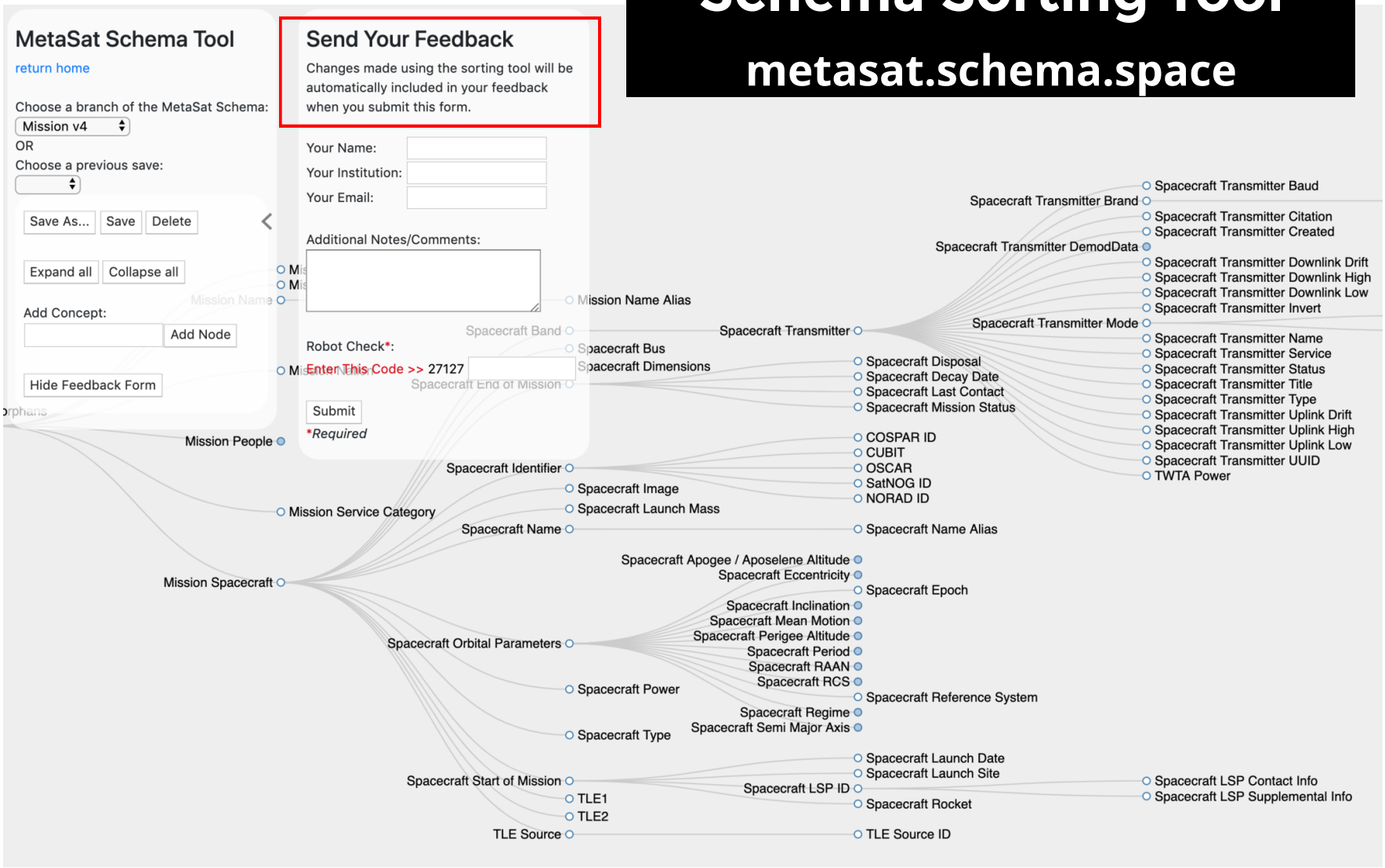
Milestones
Merge Requests 0
Members
Collapse sidebar
metasat › Issues
Open 16
Closed 27
All 43
New issue in Schema Drafts
Search or filter results...
Created date
Draft LSTN document: What libraries can do with a ground station
meetings#33 · opened 1 day ago by Allie Williams LSTN To Do Wolbach
0 updated 1 day ago
Confirm workflow for changes in schema and sharing changes with Libre Space
meetings#31 · opened 1 day ago by Allie Williams MetaSat To Do Wolbach
0 updated 1 day ago
Draft emails to LSF contacts
meetings#30 · opened 1 week ago by Allie Williams Contacts MetaSat To Do
0 updated 1 week ago
incorporate version flag into the save file
sorting-tool#10 · opened 1 week ago by Katie Frey
0 updated 1 week ago
get json from gitlab repo
sorting-tool#9 · opened 1 week ago by Katie Frey
0 updated 1 week ago
back button
sorting-tool#8 · opened 1 week ago by Katie Frey
0 updated 1 week ago
Add undo button
sorting-tool#7 · opened 2 weeks ago by Daniel Chivvis
0 updated 2 weeks ago

Schema Sorting Tool

metasat.schema.space



Metadata is Not Neutral

Metadata reflects a community's
shared meaning and values.

Don't let other people define these things for you.
Help define the lexicon.

Your contribution matters.