

Observation Facilities in the VO

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Why

- The VO can be used to search for observations using the **ObsTAP** or **EPN-TAP** discovery interfaces.
- They use “instrument_host_name” or “facility_name” keywords.

Find Hubble observations of Saturn in Nov. 1997.

VS.

Find HST observations of Saturn in Nov. 1997.

- No official nomenclature/standard for “observation facilities”.
- Some concepts already have standard nomenclature:
EPNcore is requiring the use of IAU names for solar system bodies.

Observation Facilities

- Need for a standard nomenclature for observation facilities (observatories, telescopes, spacecraft...) and instruments (experiments, instruments, sensors).

Observation Facility	Instrument
has parts: <instruments>	is part of: <observation facility>
location metadata (coordinates, planet, orbit...)	measurement capability metadata (spectral range, field of view...)

- Use cases
 - data discovery: EPN-TAP, ObsTAP
 - data tagging: VizieR
- Let's build a name resolver (vocabulary) using available lists
 - Several lists identified (some have several hundred items).
 - Merging heterogeneous lists is complex
 - Need to check for every missing or ambiguous term

Some of the available lists

List	Facility Type	number of Records
NSSDC	space	1571
NASA/NAIF	space	307
NASA/PDS	space	510
SPASE	space + ground	1970
SANA	space	1513
AAS	ground	563
Harvard/ADS	ground	2056
IRAF	ground	28
IAU/MPC	ground	2335
Xephem	ground	461
WMO/Oscar	space	683
WISERep (telescopes)	ground	108
Astroweb	space + ground	375

More: <https://github.com/ept-vespa/FacilityList/tree/master/data>

Connecting with Wikidata

- Wikidata = free and open knowledge base
 - => structured data (export in RDF, JSON)
(each item has properties + values)
 - => connected with wikipedia, Wiktionary
- Wikidata can be queried with API and SPARQL
- Wikidata can be edited manually or by API
- For *Observation Facilities*:
 - many identifiers are already connected
 - model/properties are adequate
 - curation / extension is feasible

Wikidata record example

The image shows a Wikidata record for the Hubble Space Telescope (Q2513). The record includes a description, a list of labels in multiple languages, and a table of aliases. Annotations with arrows point to specific parts of the record:

- Label:** Points to the Wikidata logo in the top left corner.
- Wikidata ID:** Points to the identifier "Hubble Space Telescope (Q2513)" at the top of the record.
- Alias:** Points to the "HST | Hubble" text below the description.
- Property:** Points to the "instance of" label in the "Statements" section.
- Qualifier:** Points to the "space observatory" value in the "Statements" section.

Language	Label	Description	Also known as
English	Hubble Space Telescope	unmanned space telescope launched into outer space by NASA and ESA in April 1990	HST Hubble
French	télescope spatial Hubble	télescope spatial	HST Hubble Space Telescope Hubble télescope Hubble Telescope spatial Hubble Large Space Telescope Télescope spatial Hubble
Spanish	telescopio espacial Hubble	telescopio en órbita alrededor de la Tierra lanzado en 1990	HST Telescopio Hubble Telescopio Espacial Hub... Telescopio espacial Hubble TEH Hubble (telescopio)
German	Hubble-Weltraumteleskop	Weltraumteleskop für sichtbares Licht, Ultraviolett- und Infrarotstrahlung	HST Hubble Space Telescope Hubble-Space-Telescope Hubbteleskop Hubble-Teleskop Hubble

Statements

instance of **space observatory** [edit](#)

[0 references](#) [+ add reference](#)


Wikidata record example

Meudon Observatory (Q13104410)...

French solar observatory edit
Observatoire de Paris-Meudon

- [Recoin: Most relevant properties which are absent](#)
- [In more languages](#)

Statements

instance of	<div><p>astronomical observatory ... edit</p><p>▸ 1 reference</p><p>+ add value</p></div>
part of	<div><p>Domaine national de Meudon ... edit</p><p>▾ 0 references</p><p>+ add reference</p><p>+ add value</p></div>
image	<div><p> edit</p><p>Meudon Observatory (3559558087) (cropped).jpg 2,985 × 1,558; 1.12 MB</p></div>

Identifiers

Minor Planet Center observatory code	<div><p>005 edit</p><p>▾ 0 references</p><p>+ add reference</p><p>+ add value</p><p>+ add statement</p></div>
---	--

Wikidata record example

Mars Express (Q205672)...

European Mars orbiter
MEX

 edit

► [Recoin: Most relevant properties which are absent](#)

► [In more languages](#)

Statements

instance of

 planetary probe ...

 edit



▼ 0 references

+ add reference

 orbiter ...

 edit

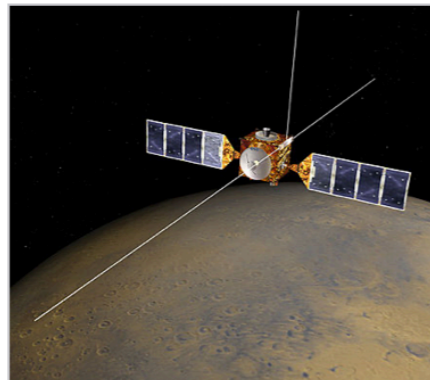


relative to

[Mars ...](#)

▼ 0 references

image



Mars Express illustration highlighting MARSIS antenna.jpg

Identifiers

COSPAR ID

 2003-022A


 edit



► 1 reference

+ add value

NAIF ID

 -41 ...

 edit



► 1 reference

+ add value

NSSDCA ID

 2003-022A

 edit



▼ 0 references

+ add reference

+ add value

Steps of merging lists

- Finding all properties and values which match observations facilities (spacecraft, observatory...)
- Extracting observation facilities from Wikidata using a SPARQL query (results are in JSON)
- Search extracted Wikidata data for information in observation facilities lists.
—> Python scoring function using Fuzzy-Wuzzy library
- Results analysis: verification unfound elements add missing items, external id

Contributing to Wikidata

Adding manually

Edit an item
Add aliases, properties...

*Caveat: need to follow rules
of wikidata community*

Tools for mass contributions



Quickstatements:

<https://quickstatements.toolforge.org/#/>



OpenRefine:

<https://openrefine.org/>

Importing extracted Wikidata data in Elasticsearch

The screenshot shows the Elasticsearch web interface. The search bar contains 'hst' and the index is 'obsfacility_index'. The search results are displayed in a table with 5 hits. The table has columns for 'label', '_score', and 'aliases'. The results are sorted by '_score' in descending order.

label	_score	aliases
hubble-space-telescope	7.834	[Large Space Telescope, 哈柏太空望遠鏡, 哈勃空間望遠鏡, 哈勃望遠鏡, 哈勃望远镜, 哈勃太空望遠鏡, 哈勃太空望远镜, 哈勃天文望远镜, 哈伯望遠鏡...]
sts-103	6.388	[HST SM-3A, Дискавери STS-103, STS 103, STS 103, STS-103]
sts-82	6.388	[STS 82, HST SM-2, Дискавери STS-82, STS 82, STS-82]
sts-125	5.421	[Дискавери STS-125, Атлантис STS-125, STS 125, HST-SM4, Hubble Space Telescope Servicing Mission 4, HST-SM4, STS-400, ...]
sts-61	5.157	[HST SM-1, Индевор STS-61, STS 61, إس تي 61-61, إس تي 61, STS-61]

Name Resolver for observation facilities

<http://voparis-elasticsearch.obspm.fr/obsfacility/resolve?q=hst>

Examples

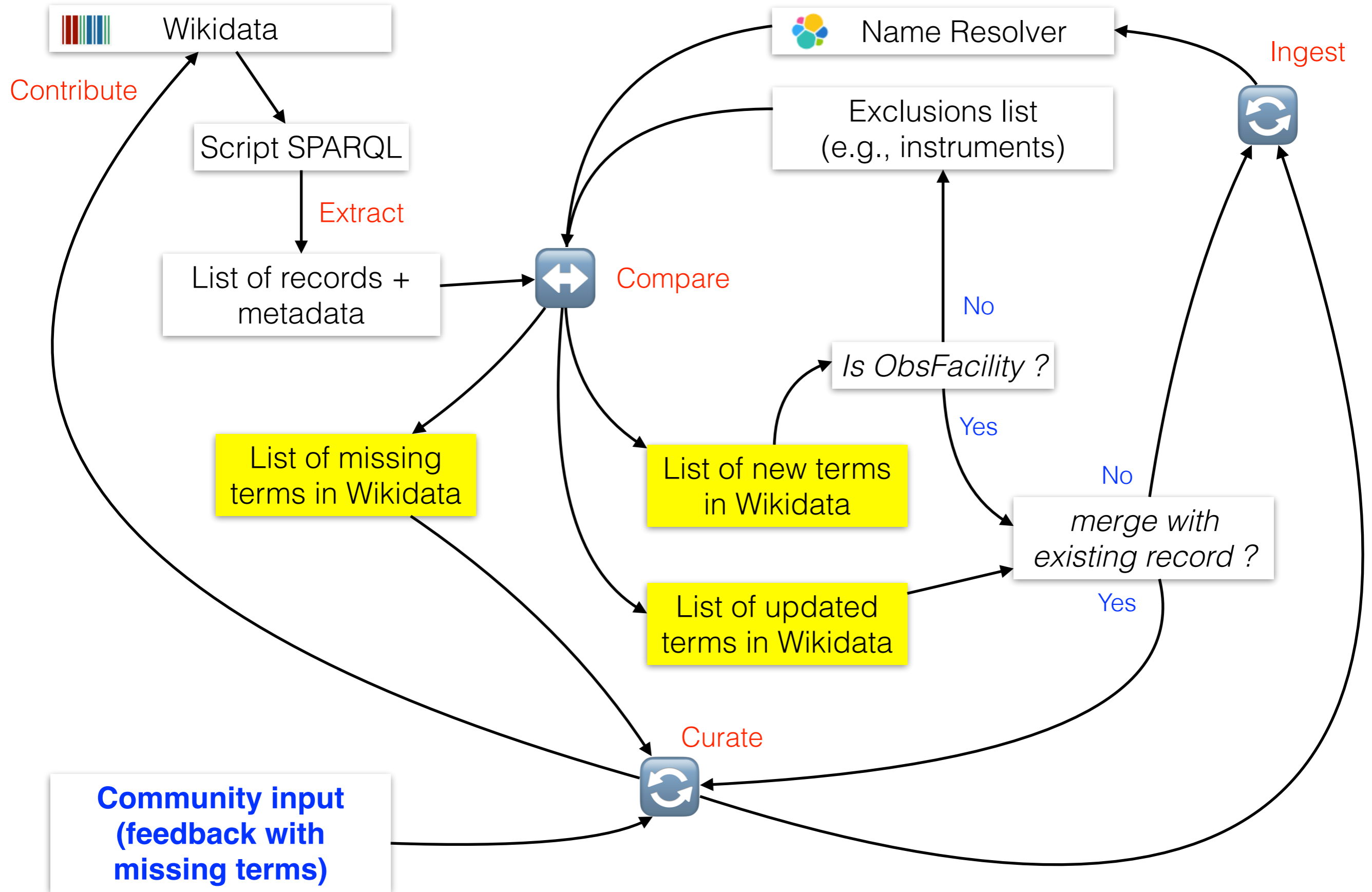
<http://voparis-elasticsearch.obspm.fr/obsfacility/resolve?q=hst>

```
{"total": 5, "results": [{"label": "hubble-space-telescope"}, {"label": "sts-103"}, {"label": "sts-82"}, {"label": "sts-125"}, {"label": "sts-61"}]}
```

<http://voparis-elasticsearch.obspm.fr/obsfacility/resolve?q=hubble>

```
{"total": 26, "results": [{"label": "hubble-space-telescope"}, {"label": "hubble-deep-field"}, {"label": "hubble-ultra-deep-field"}, {"label": "hubble-legacy-field"}, {"label": "hubble-extreme-deep-field"}, {"label": "cluster-lensing-and-supernova-survey-with-hubble"}, {"label": "hubble-deep-field-south"}, {"label": "cosmic-evolution-survey"}, {"label": "space-telescope-imaging-spectrograph"}, {"label": "cosmic-origins-spectrograph"}, {"label": "advanced-camera-for-surveys"}, {"label": "wide-field-camera-3"}, {"label": "cosmic-assembly-near-infrared-deep-extragalactic-legacy-survey"}, {"label": "faint-object-spectrograph"}, {"label": "near-infrared-camera-and-multi-object-spectrometer"}, {"label": "high-speed-photometer"}, {"label": "goddard-high-resolution-spectrograph"}, {"label": "sts-61"}, {"label": "wide-field-and-planetary-camera-2"}, {"label": "wide-field-and-planetary-camera"}, {"label": "faint-object-camera"}, {"label": "corrective-optics-space-telescope-axial-replacement"}, {"label": "sts-103"}, {"label": "fine-guidance-sensor"}, {"label": "sts-125"}, {"label": "brightest-of-reionizing-galaxies-survey"}]}
```

Maintaining up-to-date information



Vocabulary

Label

Description

Wikidata URI

mariner-4	Robotic spacecraft sent by NASA to Mars	http://www.wikidata.org/entity/Q203805
Mars-express	European Mars orbiter	http://www.wikidata.org/entity/Q205672
Mars-global-surveyor	US spacecraft developed by NASA's Jet Propulsion Laboratory	http://www.wikidata.org/entity/Q206300
2001-Mars-odyssey	2001 NASA orbiter studying the geology and hydrology of Mars	http://www.wikidata.org/entity/Q207164
exomars-trace-gas-orbiter	European-Russian Mars orbiter	http://www.wikidata.org/entity/Q2090722
vikings-1	space probe sent to Mars	http://www.wikidata.org/entity/Q210199
Mars-orbiter-mission-2	proposed Indian Mars orbiter	http://www.wikidata.org/entity/Q21027956

Any questions ?

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SPARQL query example



Wikidata Query Service

Exemples

Assistant de requêtes

Aide

Davantage d'outils

français



```
1 PREFIX schema: <http://schema.org/>
2 PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
3 PREFIX wikibase: <http://wikiba.se/ontology#>
4 PREFIX bd: <http://www.bigdata.com/rdf#>
5 SELECT
6   ?item
7   ?itemLabel
8   (GROUP_CONCAT(DISTINCT ?alias; SEPARATOR="|") AS ?aliases)
9 WHERE
10 {
11   ?item p:P31 ?stat .
12   #item instance of
13   {?stat ps:P31 wd:Q148578 .} # space observatory
14   OPTIONAL {?item skos:altLabel ?alias .}
15   SERVICE wikibase:label { bd:serviceParam wikibase:language "[AUTO_LANGUAGE],en". }
16 }
17 GROUP BY ?item ?itemLabel
```



147 résultats en 1109ms

Code

Télécharger

Lien

item	itemLabel	aliases
wd:Q19764	Astron	
wd:Q48633	Corot	CoRoT Convection Rotation and Planetary Transits CONvection ROTation and planetary Transits Convection, Rotation and planetary Transits CoRoT コロト衛星 COROT space telescope CONvection ROTation and planetary Transits
wd:Q49694	EXOSAT	Sat European X-ray Observatory Satellite

Previous works

- Fuzzy-logic tool for matching lists, developed by Graz team (EPN2020RI project):
<https://github.com/eptn-vespa/FacilityList>
- Prototype at IMCCE, using their Quaero search engine. Example:
<https://api.ssodnet.imcce.fr/quaero/1/sso/ACE>
- CDS Telescope/Instrument database for Vizier
- NASA/PDS4 information model: “context product” with identifier, related products and metadata

Maintaining up-to-date information

Updating Wikidata:

- Refresh Observation Facilities lists
- Update Wikidata Extract
- Check for missing information
- Contribute

Updating the name resolver:

- Make a new Wikidata extract
- Verify changes before transitioning ?
- > Develop sanity/regression Tests ?
- Import into Elastic Search