

[52.01] Virtual Observatories: Are We Virtually There Yet?

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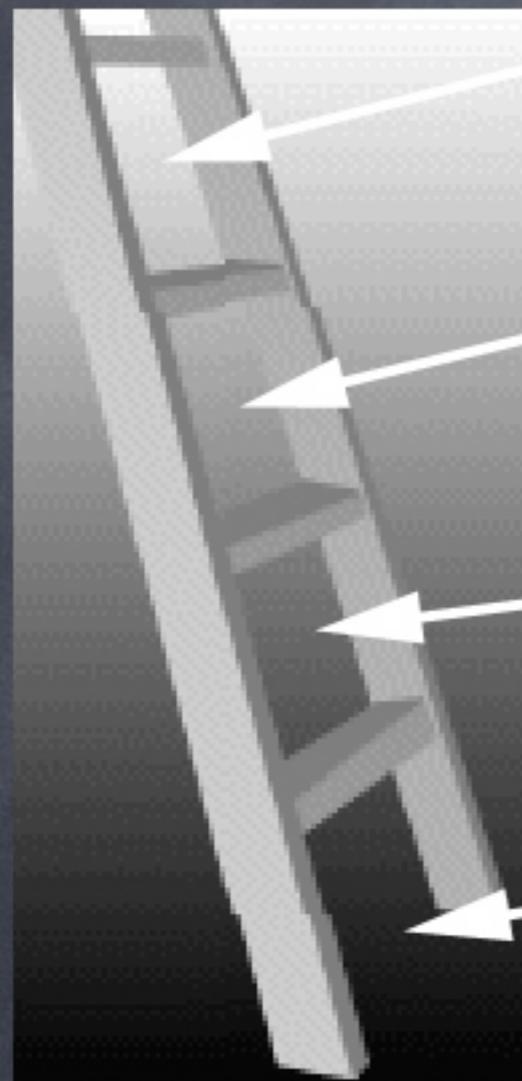
NASA Goddard Space Flight Center

....but with ideas liberally
stolen from:

- 👁 the VSO implementers
- 👁 the EGSO team
- 👁 the IVOA Website
- 👁 LWS data environment working group
- 👁 the NASA Sun–Earth Connections Data and Computing Working Group (VSPO, VHO, &c.)
- 👁 some guy from Colorado who uses my figures in talks and EOS articles

The **updated** astronomical sexiness ladder

(with apologies to J. Drake and T. Ayres)



Far away and long ago
stuff

Stellar astronomy

Solar physics

Astronomical data

Virtual Observatories 101

👁️ Why?

- 👁️ Lots of data, and ever more data sources

- 👁️ Multiple data sources:

 - 👁️ ostensibly give us a more complete understanding of phenomena

 - 👁️ allow us to check that odd results are not instrumental

 - 👁️ is something fairly well ingrained in solar physicists

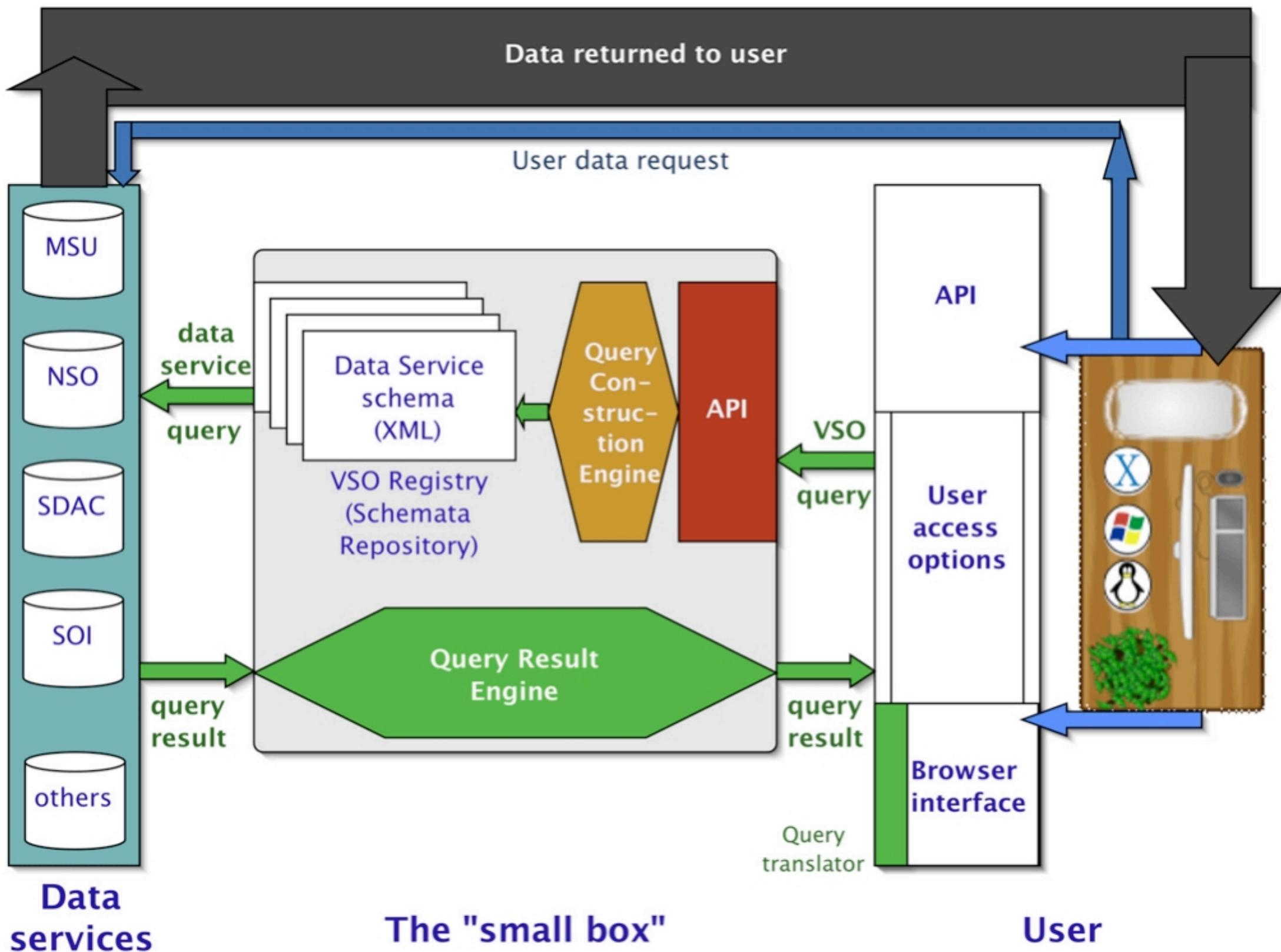
Virtual Observatories 101

👁️ What?

- 👁️ Virtualization of search and identification
- 👁️ Collapsing of multiple potential searches
- 👁️ Standardized query formation methods
- 👁️ Standardized data service information
 - 👁️ Standards for metadata
 - 👁️ Unified data model

Virtual Observatories 101

- 👁️ What? (continued)
 - 👁️ Delivery of data or at least pointers to data
 - 👁️ Capacity to absorb new data services
 - 👁️ Optionally, some or all of:
 - 👁️ software and documentation resources
 - 👁️ query logging
 - 👁️ distributed processing
 - 👁️ authentication services



The infamous "small box"

Virtual Observatories 101

👁️ How?

- 👁️ Consortia of institutions with “popular” data
- 👁️ National agency (NSF, NASA) or EC funding
- 👁️ Willingness of community to use tool

How would we use a VO?

- To do the kind of science we do now, but
 - faster and better (cf. Matt Penn's talk [52.02])
- To do kinds of science we rarely do in solar physics, yet:
 - assimilation models that produce predictions of e.g. space weather at earth (Mars?)
 - data identification and search tools that benefit non-solar physicists
 - applying novel methods to diverse data (Haimin Wang's talk [52.09])

How would we use a VO?

(II)

- To access other solar VO's, or to be accessed by them as a data service (Rob Bentley's talks [52.06], [52.07])
- As a data service for a broader, solar-terrestrial "collaboratory" (Neal Hurlburt's talk [52.08])

For whom are we designing VO's?

- One Size Fits All is a very big box
 - No one has the time or resources to build that box
 - “Small box” is initially just for solar physicists, or others familiar with a fair bit of jargon
 - CoSEC, eventual meta-V-SEC-O are designed for solar-terrestrial scientists

But what about everybody else?

- 👁 EOSDIS (\$500M – \$1B) is a cautionary tale
 - 👁 requirement gallop
 - 👁 political football
- 👁 Allow anyone to build an interface that works for a specific user community; requires:
 - 👁 robust Application Programming Interface (API)
 - 👁 standards (e.g. SOAP) to make coding client-VO (or VO-VO) communication simpler

Are we there yet?

- No, not yet:
 - Cost and time
 - Rule of thumb: Cost is proportional to the number of initial data services (0.5 programmer FTE + 0.5 scientist FTE per year, per site)
 - Larger efforts require finite management resources as well
 - Nagging problem of metadata standardization (data dictionaries/models)

Will we be there soon?

- EGSO, VSO, CoSEC, VSPO, VHO, IVOA all making progress
- Diversity of efforts is producing mutually useful tools
 - VOTable (XML) from IVOA
 - multiple catalog search from EGSO
 - use of SOAP from VSO
 - pipeline approach from CoSEC
 - possibility of meaningful ontologies from worrying about metadata standards
 - concept of an eHY enabling more and better science

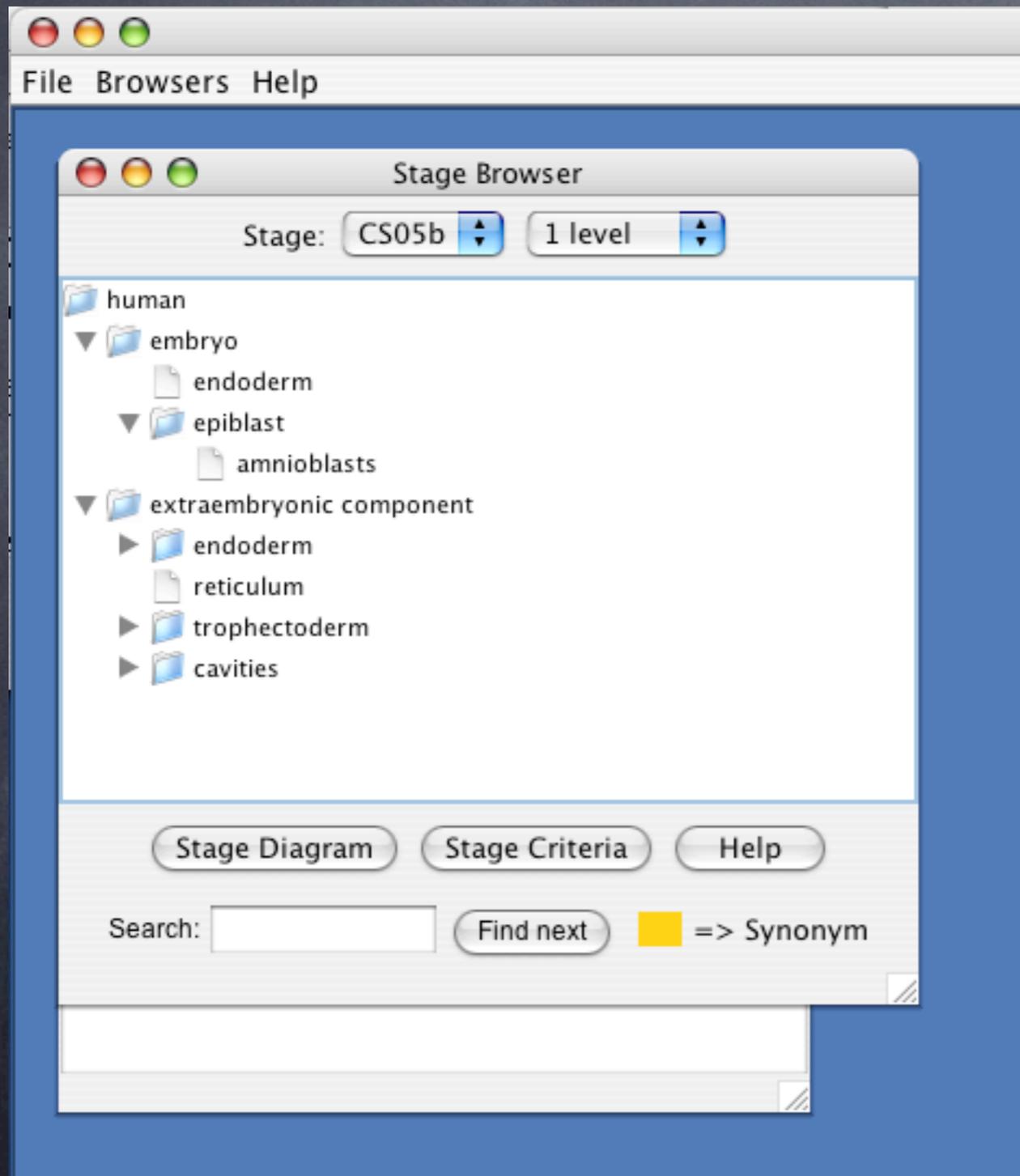
The beginning.....

.....of the VO age

A Little Acronym Music

- 👁️ EGSO = European Grid of Solar Observations
- 👁️ VSO = Virtual Solar Observatory
- 👁️ VSPO = Virtual Space Physics Observatory
- 👁️ VHO = Virtual Heliospheric Observatory
- 👁️ IVOA = International Virtual Observatory Alliance
- 👁️ SEC = Sun-Earth Connections
- 👁️ eHY = electronic Heliophysical Year

What does an ontology look like?



Example from
Edinburgh Human
Development
Anatomy project,
showing elements
without rules