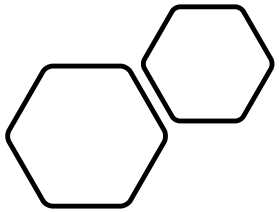
A Brief History of the IVOA

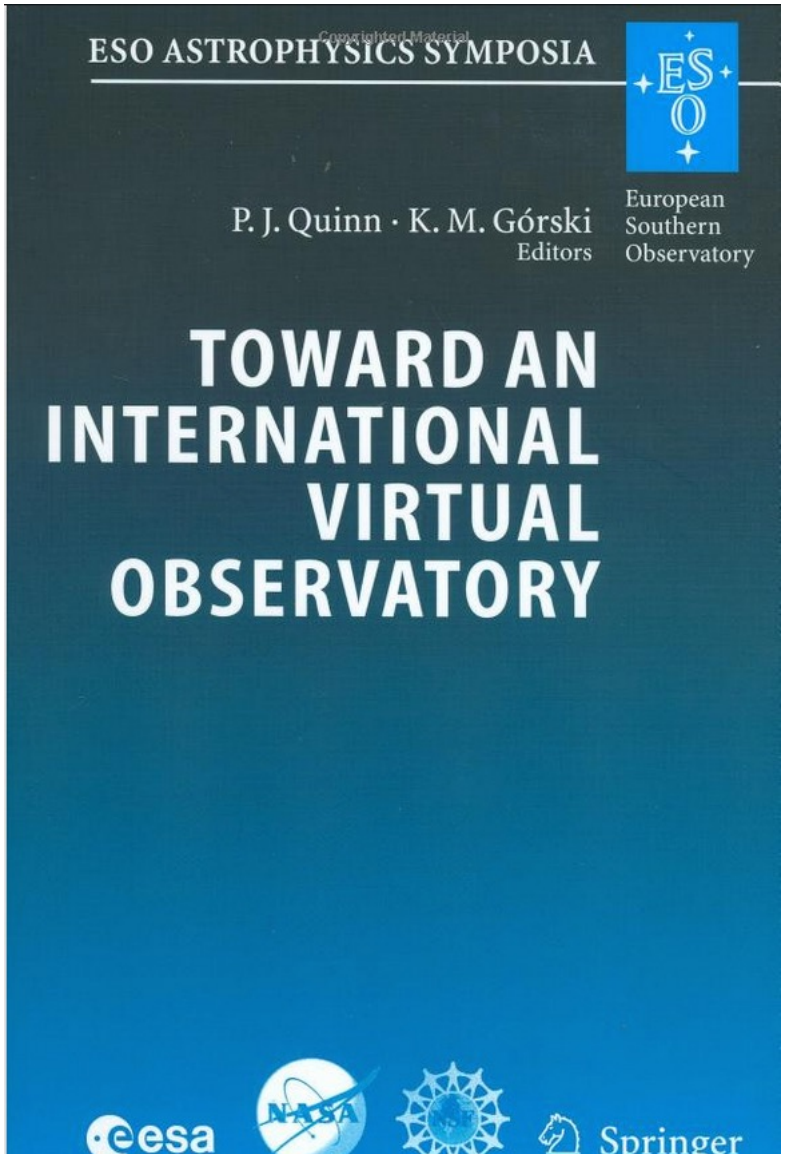
Virtual IVOA Interoperability Meeting, October 2022.

https://www.ivoa.net/



G. Bruce Berriman

Chair, IVOA Executive Committee



Formally founded in 2002 at the conference "Toward an International Virtual Observatory" (Quinn and Gorski 2004). Garching, Germany.

The IVOA Has Grown Since 2002 …

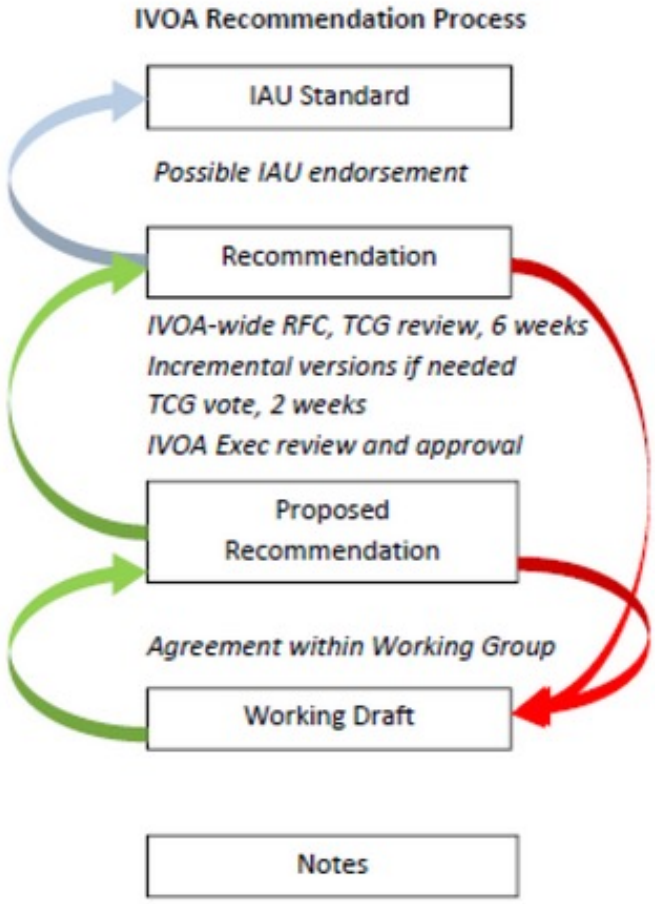
- Founding partners:
  - Astrophysical Virtual Observatory (AVO, ESO)
  - AstroGrid (UK)
  - National Virtual Observatory (USA)
- Membership open to nationally-funded VO-projects and international organizations.
  - See Hanisch et al (2010) https://www.ivoa.net/documents/latest/IVOAParticipation.html
- By 2004, there were 15 partners, and in 2022, there are 24.
  - Two new members
- Partners seek funding from their national funding agencies

… the organization has remained steady

- The original organization and structure of the IVOA are still in place!
- They have evolved to reflect the fast-changing landscape of astronomy data.
- Read about the early days in the report by Norris (2004) “Report to the 24th CODATA General Assembly on data activities in the International Astronomical Union.” https://ivoa.net/documents/latest/Codata.html
- … and the latest docs and standards at https://ivoa.net/documents/index.html

Organization of the IVOA

- The IVOA patterned itself after the World-Wide Web Consortium (W3C):
  - Adopted its process for the development of standards (Working Drafts ! -> Proposed Recommendations -> Recommendations)
  - Standards documents developed by a set of working groups.
- Two Interoperability Workshops each year.



The IVOA's Mission

"To facilitate the international coordination and collaboration necessary for the development and deployment of the tools, systems, and organizational structures necessary to enable the international utilization of astronomical archives **as an integrated and interoperating Virtual Observatory.**"

-As formulated at "Towards an International Virtual Observatory"

Why Was the IVOA Necessary?

- FITS was the first standardization of data -> easy interchange of data across sub-disciplines and paved the way for multiwavelength analysis.
- VO driven by the “data tsunami.” -> Seamless and transparent discovery of data and access to them.
  - The world’s astronomy data on your desktop!
- VO committed at the outset to open data and transparency -> FAIR principles long before they were ever formalized as such.

Major Technical Initiatives (2004) Still Important

Initiative	Description
Registries	The “Yellow Pages” of the VO
Data Models	Representation of data and relation between them
Uniform Content Descriptors	Semantic description of metadata
Data Access Layer	Provides standardized access mechanisms to distributed data objects.
VO Query Language	Dialect of SQL to support astronomical queries
Grid and Web Services	Tools located with data collections for discovery and analysis
VO Table	XML markup standards for tabular data

Success has been hard earned!

- Hard lessons learned! Including …
  - Foster community and mission participation
  - Deliver standards and updates in a timely fashion
  - Publish roadmaps each year to guide development.
- VO standards now underpin queries in the world's major astronomy archives: if you get data from them you are very likely using the VO.
  - Gaia release (2016) was the VO's "coming of age."
- VO standards are being incorporated into the query infrastructure of missions and telescopes, including those in development: Euclid, Vera Rubin Observatory …