Astronomy and Computing 7–8 (2014) 1–2

Contents lists available at ScienceDirect

Astronomy and Computing

journal homepage: www.elsevier.com/locate/ascom

Editorial

The Virtual Observatory: I

The concept of the Virtual Observatory arose more-or-less simultaneously in the United States and Europe circa 2000. Ten pages of *Astronomy and Astrophysics in the New Millennium: Panel Reports* (National Academy Press, Washington, 2001), that is, the detailed recommendations of the Panel on Theory, Computation, and Data Exploration of the 2000 Decadal Survey in Astronomy, are dedicated to describing the motivation for, scientific value of, and major components required in implementing the National Virtual Observatory. European initiatives included the Astrophysical Virtual Observatory at the European Southern Observatory, the AstroGrid project in the United Kingdom, and the Euro-VO (sponsored by the European Union). Organizational/conceptual meetings were held in the US at the California Institute of Technology (*Virtual Observatories of the Future*, June 13–16, 2000) and at ESO Headquarters in Garching, Germany (*Mining the Sky*, July 31–August 4, 2000; *Toward an International Virtual Observatory*, June 10–14, 2002). The nascent US, UK, and European VO projects formed the International Virtual Observatory Alliance (IVOA) at the June 2002 meeting in Garching, with yours truly as the first chair. The IVOA has grown to a membership of twenty-one national projects and programs on six continents, and has developed a broad suite of data access protocols and standards that have been widely implemented. Astronomers can now discover, access, and compare data from hundreds of telescopes and facilities, hosted at hundreds of organizations worldwide, stored in thousands of databases, all with a single query.

Obtaining the financial resources to implement the Virtual Observatory was, in the early days, not very difficult. The VO rode a wave of interest and ample funding in basic information technology research and development. But around 2010, as more of the costs of the VO projects needed to be borne by astronomy funding per se, VO resources became scarcer. The UK's AstroGrid project was terminated in 2010 (though AstroGrid resources continue to be supported in a distributed manner). The US NVO became the Virtual Astronomical Observatory, funded by the National Science Foundation and the National Aeronautics and Space Administration, but the NSF/NASA collaboration was somewhat awkward, and in mid-2013 NSF and NASA decided to terminate the VAO program on September 30, 2014. NASA intends to maintain core VAO capabilities through its network of data centers, but at much reduced expense, and therefore, with reduced levels of service and development. The funding situation could be interpreted as a measure of success, i.e., that the hard work has been done and VO capabilities are taken as a given. Still, the VO being implicitly and intrinsically a distributed effort, coordination and collaboration are essential — and cost money. Also, information technology changes rapidly, meaning that any software system requires ongoing maintenance and will need to incorporate new capabilities to stay relevant. Fortunately, the IVOA continues on a resolute course, though as support at the national level in some countries wavers the ability to move forward will undoubtedly be affected.

It is in this context – of marked success for the VO developments of the past decade or more, and yet of significant uncertainty of what the future may bring – that the editors and Scientific Advisory Board decided there should be a focus on the VO in the pages of *Astronomy and Computing*. Two special issues of *A&C* are planned: the current issue and another to follow in about six months' time. These issues are not organized by content beyond being VO-related, so I provide here a bit of a road map to help put the papers in perspective.

In this first issue two papers describe core components of the VO infrastructure (Nandrekar-Heinis et al., on the Table Access Protocol, and Demleitner et al. on the VO Registry). Several others describe the take-up of VO protocols in the environment of data centers in astronomy, space physics, and planetary science (Demleitner et al. on DaCHS, Genot et al. on the use of the Simple Applications Messaging Protocol in space physics, Erard et al. on the use of the Table Access Protocol in planetary science, Erard et al. on the VO architecture as deployed for planetary science, and Michel et al. on the *Saada* toolkit for exposing a data collection to the VO). The remaining papers focus on science applications and toolkits that exploit VO standards and infrastructure (Ruiz et al. on AstroTaverna, Swinbank on the VOEvent broker *Comet*, Pietrinferni et al. on a VO-accessible database of stellar evolution models, Laurino et al. on the *Iris* spectral energy distribution analysis application, and Skoda et al. on the *SPLAT-VO* application for spectroscopic data analysis). A brief editorial will accompany the second issue to provide context for the papers appearing there.

The long-term impact of the VO remains to be seen, and is rather difficult to measure. There are many tens of papers in the research literature that explicitly mention the use of VO tools and VO-accessible data collections. There are undoubtedly a much larger number of research results that have been enabled by the VO in-

http://dx.doi.org/10.1016/j.ascom.2014.07.006
2213-1337/

frastructure, and the authors/users are unaware. Researchers do not give credit to TCP/IP or XML in their papers, but everyone uses these protocols daily, blissfully unaware of what goes on behind their workstation screen. Those involved in VO developments have long known that, to some extent, successful deployment of the VO would be invisible to many in the community. We hope that through these special issues of *A&C* that there will come better recognition of the importance of the VO for astronomical research, and better recognition of the dedicated and talented individuals who have created this valuable infrastructure.

Guest Editor
R.J. Hanisch *
Space Telescope Science Institute, United States
US Virtual Astronomical Observatory, United States
E-mail address: hanisch@stsci.edu.

Available online 25 July 2014

* Correspondence to: Office of Data and Informatics, Material Measurement Laboratory, National Institute of Standards and Technology, United States.