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Dear Dr. Accomazzi

The inaugural meeting of the Astrophysics Data System Users Group was held January 17-18, 2017 in Cambridge, MA. The Users Group represents the many and varied constituencies of the ADS, and we are pleased to draw on our experience to offer advice to the project.

Kudos

ADS is one of NASA's best astronomy investments. On behalf of the entire astronomy community, we wish to express deep gratitude to the ADS staff for the resource they provide. Like roads or the internet, ADS is so integral to the way we carry out our work that we often forget that it is due to the very hard work and persistence of a small handful of dedicated people. We simply cannot imagine a world without it. We need only look to our colleagues in other disciplines to see how our academic pursuits could be much harder without ADS.

ADS has been ahead of the curve in the way academic information is exchanged since its inception, and remains a technological leader. Many repositories of academic information are only now considering the move to the cloud, whereas in *Bumblebee* (see below) ADS has already made that leap. Much of astronomy infrastructure could learn from the well-thought-out and persistent innovation that ADS has always accomplished.

Bumblebee

The ADS team has been working on a new system to replace its aging IT infrastructure. Over the past two years these efforts have focused on developing a modern, information-rich user interface code-named Bumblebee (<https://ui.adsabs.harvard.edu>), backed by a well-engineered Application Programming Interface (API) and open-source search engine (Apache SOLR). This software infrastructure takes advantage of cloud computing (it is hosted in Amazon Web Services) and relies on a data ingest pipeline which leverages ADS's traditional data holdings but enriches them with full-text content as well as data from ORCID (<http://orcid.org>). The new

system is meant to significantly enhance the capabilities of the ADS Classic search engine (<http://adsabs.harvard.edu>) and will eventually replace it.

The ADS Users Group recommends that ADS proceed with an expedited move to the ADS Bumblebee from the classic platform, and discontinue support for the classic platform. Such a transition should be fairly smooth since Bumblebee has available tabs for both the “Classic Form” and the “Modern Form.” The Classic Form looks and acts very much like the familiar classic platform, so that an expedited transition and termination of the classic site should not cause undue consternation. We recommend that the ADS group prioritize the launch of Bumblebee with its classic functionality and engage the public to use it. Additional features (e.g., user’s profiles) can be deferred. We recommend that a schedule be created for this very much-needed transition, especially given the short-staffing situation on ADS (see below). We acknowledge that a robust restructuring of infrastructure may be needed to accommodate dramatically larger numbers of users on Bumblebee. We note that the discontinuation of ADS Classic will significantly free up resources to enable further development.

Staffing

The existing ADS team is characterized by a small number of expert developers and researchers assigned to specific distinct roles. We were impressed by how these individuals related to each other, and by the clear understanding of how the many different roles needed to work together. The team is currently operating with four vacancies but thanks to clear leadership, the team is coping under these difficult circumstances.

However, the existing organizational structure is vulnerable to the loss of a single staff member in many places (i.e., single-point failures). Staff turnover, common in IT environments, is exacerbated by significant delays in both finding appropriate staff and then hiring. Given that the community depends on the ADS to such an extent that even short outages have significant impact, such a critical part of the research infrastructure needs support. *We therefore recommend the creation of two new roles, funded by two **additional FTEs** funding to enable overlap on critical development and infrastructure tasks.* These additional FTEs will reduce risk given inevitable staff turnover.

These additional staff positions and existing vacancies are only useful when filled. We acknowledge that attracting developers and other staff in a competitive economy is difficult, and we recommend that ADS (within CfA) look at creating the most attractive possible package. This may mean reviewing salaries, increasing flexible working and considering remote working. The staff should have time for self-directed learning, and keeping up with new technology is essential. For science staff, independent time for research in astronomy or data sciences would benefit ADS: as the field evolves, it is important to stay engaged with the astronomy research community so as to provide the right services. Temporary hires or internships for more junior staff who could learn on the job may also provide a route to finding new staff. Finally, ADS should look at rolling recruitment, acknowledging that turnover in the tech industry is likely to remain common. We recommend that ADS explore these possibilities with CfA leadership if any run counter to institutional hiring practices.

Finally, the success of ADS to date is owed substantially to its clear leadership. Succession planning for leadership positions (or at least risk management for changes) is needed. ADS should expand its searches to include people who could become appropriate replacements for the Principal Investigator and Project Scientist.

Architecture/UI

While there were several visually engaging interpretation tools presented, we feel that the primary focus of the Architecture/UI group should be the functionality of the interface, not prettying up the GUI. The front end requires clear, precise language and a straightforward methodology. The main focus of the UI should be providing the best and most complete results to the user, from a stable and robust system. Given the increasingly changing ways that data is being published (software, data, blogs, etc.), enabling a rock-solid functional system is critical. The visual analysis tools can be brought online (or expanded) at a later date.

We note that a more robust architecture, complete with redundant hardware systems (or equivalent cloud-based support), should be implemented sooner rather than later. While single-point failure concerns are not as high here as for other areas, it is still a concern.

Planetary

Although Planetary Astronomy/Science is technically out of scope for ADS, the continued growth of exoplanet studies means astronomers and planetary scientists will become more aligned and often more dependent on similar academic resources (e.g. atmospheric chemistry). As of now, ADS already contains a significant fraction of material useful for the planetary astronomy community. What resources are required to curate planetary science content as accurately and completely as astronomy? *We recommend the ADS study the possibility of incorporating Planetary Science into its core holdings.* Given the extent of ADS coverage of this area, it is not clear whether an expansion is needed. Perhaps soliciting input at a DPS meeting and contacting NASA data resources (e.g. Planetary Data System) would help assess whether or not such an expansion would be valuable to planetary scientists.

We expect NASA will see a strategic value in expanding ADS, a resource the envy of almost any academic discipline, to Planetary Science and perhaps beyond. We look forward to a presentation on this topic at the next ADSUG meeting.

Sincerely yours, on behalf of the ADS Users Group.



Dr. Kathryn Flanagan
Chair, Astrophysics Data System Users Group

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