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Database Review: SAO/NASA Astrophysics Data System

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ADVISOR REVIEWS—STANDARD REVIEW

SAO/NASA Astrophysics Data System

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Composite Score: ★★★★★ 1/2

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Abstract

The Astrophysics Data System (ADS) is the premier Open Access research database for astronomy and astrophysics containing over 13 million bibliographic records. These records include journal articles, books, conference proceedings, historical observatory bulletins, and other gray literature. An exceptional feature of ADS is the visualizations it creates, showing author networks, overlapping citations, and frequently occurring terminology giving researchers new ways to explore the literature. It is a unique resource that is as easy for a novice to search as it is for skilled researchers to create precise search queries.

Pricing Options

SAO/NASA Astrophysics Data System is funded by a NASA grant. It is free to use.

Product Overview/Description

The SAO/NASA Astrophysics Data System (ADS) was established in the late 1980s with the goal of becoming the authoritative source for astrophysics literature. It is a bibliographic portal containing over 13 million records covering astronomy, physics, geophysics, and astrophysics. It indexes both refereed and non-refereed articles, conference proceedings, books, and more. It also provides an historical scanning service of journals, conference proceedings, bulletins, and observatory publications. These historical publications cover multiple languages (English, German, French, etc.), and the scans are of microfilm/microfiche in some cases going back to the first issue.

ADS also tracks article citations and provides access and pointers to articles and data sets on publisher websites, arXiv, and other repositories. ADS is updated weekly.

Currently there are two separate interfaces for searching ADS: Classic and Bumblebee. In Spring 2019, the Classic interface will be retired (Thompson, 2018). Therefore, this review will focus on what will become the main interface. Bumblebee provides an updated search engine indexing more fields, including full-text and author affiliations; providing faster results;

and creating “paper and author network visualizations” (Lockhart, 2018).

ADS provides a very powerful search engine with extensive capabilities. It is easy enough for a novice to dive in and begin searching and yet provides researchers with the ability to craft very detailed and specific searches at the same time. There are extensive help sheets available so that it is easy to learn the different search features.

User Interface/Navigation/Searching

The initial search screen provides a clean looking interface with three separate tabs for searching. The default tab is the Modern Form, which provides example searches under the search box for new users who do not know the syntax. This makes the interface friendly and easy to use (see Figure 1). For those users who have been using the system for 25 years, the Classic Form provides a modernized version of the original search interface. One difference on this form is that searches cannot currently be limited to the arXiv database and all the original filter choices have been removed. The Paper Form provides a way for users to search by individual publication.

No matter which search is used, the results are presented in a three-column layout: filters on the left, results in the center, and visualizations and save folders on the right (see Figure 2). Visualizations display citations, reads, and years of results and act as an additional way to limit results. Results provide typical citation data using the abbreviated form of journal names. They show the number of times the article has been cited, links to the full text, links to the citations and references, and where applicable a link to the data set. The default

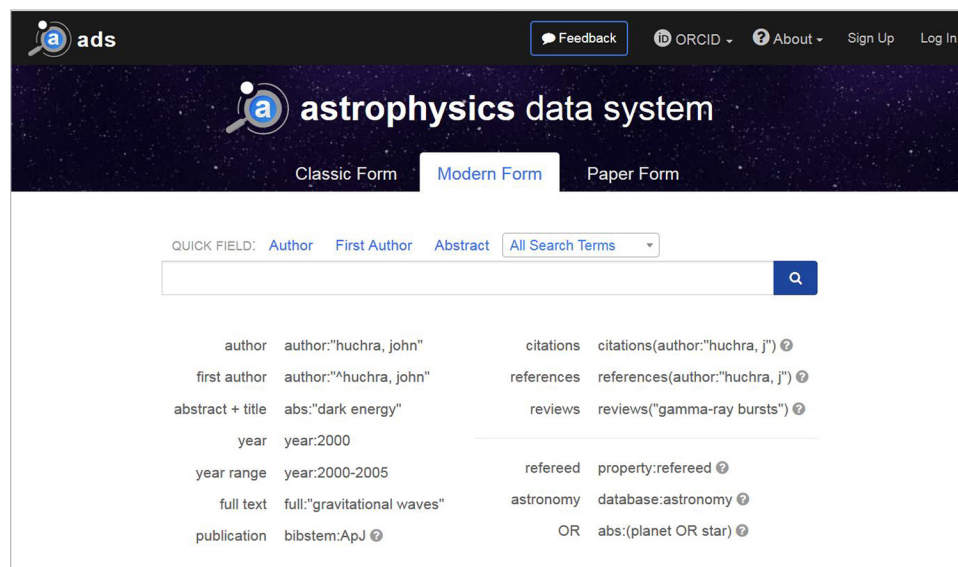


FIGURE 1 ADS Modern Form Search Screen

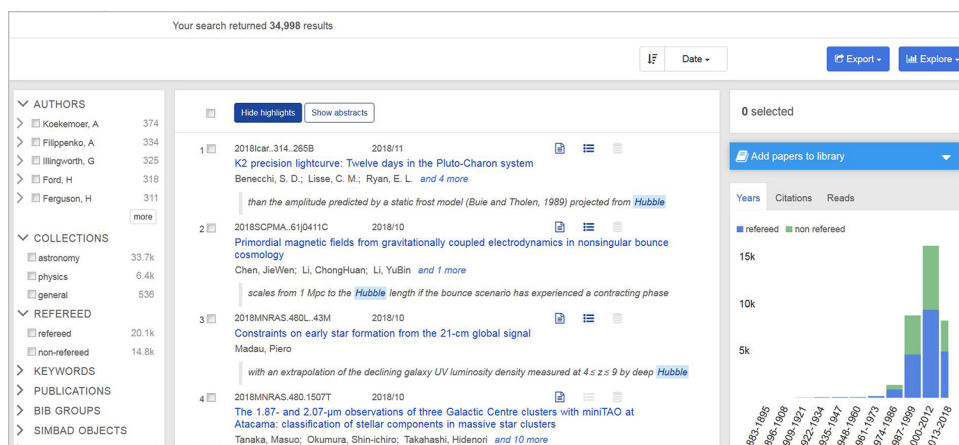


FIGURE 2 ADS Search Results

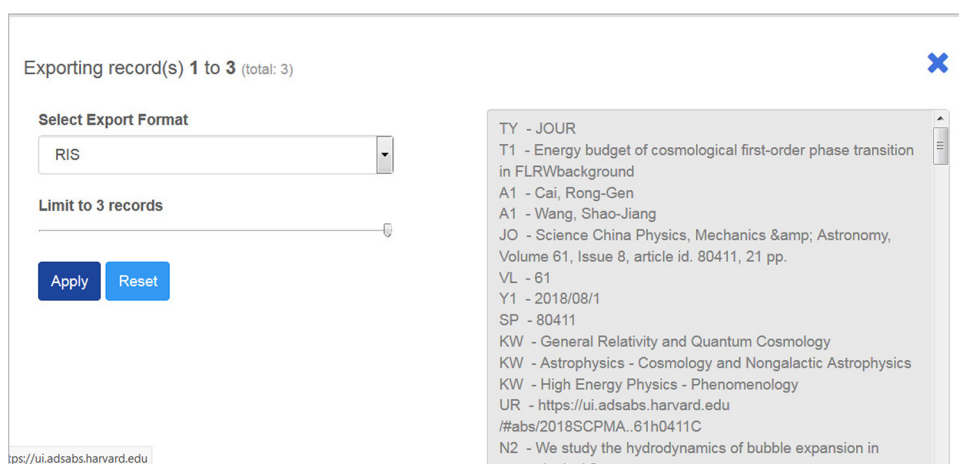


FIGURE 3 ADS Citation Export Options

sort order is by date, but results can also be sorted by journal title, citation count, and read count.

Similar to many search engines, the search results display extracted text or highlights of where the search terms were found in each article by default. These highlights can be toggled on or off. Abstracts can also be displayed by toggling a button over the search results which is a nice feature that is not always available in subscription databases.

Results include check boxes for researchers to select articles. Those selected articles can then be saved to an individual’s library or exported. Note that saving to a library requires the setting up of an account which is done by providing an e-mail address and creating a password. Results can be exported in a variety of formats including: Bib-Tex, AASTex, EndNote, RIS, ADS Classic, XML, or custom defined. Exporting results opens an overlay on the page with an in-line box with the results in the selected format (see Figure 3). The researcher can then copy the formatted results into a text file or download them as a text file for later import into his citation manager of choice.

Full records are again presented in a three-column format: links to sections within the paper, such as references, co-reads, and metrics on the left; the full abstract, complete publication data with the journal title spelled out, DOI, and key words in the center; and links to the full text and saving to a folder on the right. At this point, the user can also toggle author affiliations on or off. The metrics include reads, which are the number of times the full bibliographic record has been

viewed and the full text has been downloaded; and an analysis of the citations for articles that have cited the current article.

The ADS search box supports both field searches and open queries. Some of the most common field searches are shown in the examples below the search box with shortcuts above the search box to automatically fill in the proper syntax for the field search. This makes it very easy to do a known author search or to immediately limit to a set of years. Searches default to a Boolean AND search. Searches can be expanded by specifying OR between terms. It is also possible to narrow searches using either a Boolean NOT or prepending a minus (-) sign to the appropriate term. ADS also supports truncation searching. The asterisk (*) is used for zero or more characters and must be either at the beginning or end of the word. A question mark (?) is used for a single character and can be used anywhere within the term. These truncation symbols can also be combined.

Another interesting search feature is that search terms automatically expand to include synonymous and foreign language equivalent terms. So a search of “star” will also find “stellar” as well as “etoile.” If a researcher would prefer that only his terms were found, he would need to prepend his search terms with an equal sign (=). Search terms in uppercase, as acronyms are usually written, will result in exact case matches. ADS uses quotation marks for phrase searching. An equal sign (=) adjacent to the beginning quotation mark will restrict all terms within the quotations to an exact match otherwise synonymous terms will be included within the phrase search.

FIGURE 4 ADS Paper Form Login Prompt

Navigation through the search results uses standard browser controls. ADS does not provide a way to scroll from full record to full record without first returning to the search results. What is interesting about the user interface and navigation is that the screen becomes effectively split in two. The top half retains a search box with the quick field inputs and the bottom shows the search results or any other requested information. Within the search results, if the researcher hovers over the icons for cites or references, a pop-up box with the appropriate links will be triggered. The interface can work with just a keyboard by tabbing through it, but it is hard to know where on the screen a person is visually. Most elements will indicate that they are the active element either through underlining or highlighting, but it is easy to miss where the cursor is currently located. In terms of accessibility this could be a problem.

Critical Evaluation

The Bumblebee interface has been in development since 2015 (Lockhart, 2018). However, some of the most useful elements of the legacy interface are still being integrated. There are plans to migrate all of the browsable indexes, but only one is available in the new interface so far. The Paper Form is the update to the Journal/Volume/Page browse of the legacy interface. The confusing thing about this form is that it has a button prompting a user to log in to use the form. This makes the form unclear (see Figure 4). It is possible to enter a single journal title to browse an issue without logging in. The login is only required if a researcher wishes to input multiple Bibcodes. Bibcodes are the unique identifiers that ADS uses to describe a journal article allowing a researcher to quickly search for articles that he knows including those within the historical scanning service.

The browsable indexes only available in the legacy interface are a Table of Contents Service; Article Service; Scanned Historical Literature Service; and Scanned Book Service. One way to access these is using the site map on the legacy site <http://adsabs.harvard.edu/abs_doc/site_map/>. Until these services are migrated to Bumblebee, it would be helpful if this link were included on the new site. It appears that the developers are more focused on helping current users migrate to the new interface than on introducing all of the features of the service to new users who are starting out with the updated interface. This is understandable since the service is more than 20 years old, but adding the sitemap link to the footer or within the Help pages would make it more accessible to everyone.

Researchers who have established logins with the legacy interface need to create new logins to use Bumblebee. The good news is that ADS provides clear instructions on how to migrate any saved libraries from one interface to the other. There is also a separate myADS ser-

The screenshot shows the ADS Paper Form interface. At the top, there are three tabs: "Classic Form", "Modern Form", and "Paper Form". The "Paper Form" tab is selected. Below the tabs, there are four input fields: "Publication" (with a placeholder "e.g Astrophysical Journal"), "Year", "Volume", and "Page". To the right of the "Publication" field is a green button that says "log in to ADS to use this form". At the bottom of the form are two buttons: "Clear" and "Search".

vice which provides users with weekly notifications of new additions to the database or daily notifications of new preprints in arXiv. This service has not been moved from the legacy interface as of yet, but its usefulness is incalculable as it provides researchers with current awareness in their field. When it does move over, it will be found under Settings in an individual's account.

Though Bumblebee provides results quickly, there are times when returning to those results is not so easy. As previously noted, after looking at a full record a researcher must return to his search to get to the next result. This sometimes results in a spinning wheel of loading. After a certain period of time, a message will pop up acknowledging that the system is having a temporary problem. The pop up message is reassuring and allows the researcher to choose to wait, continue his research at another time, or redo his search.

One thing that appears to be lacking from the Astrophysics Data System is a thesaurus or standardized vocabulary. Full records may or may not contain key words. For those records that contain key words, some are derived from arXiv. If those terms are used in a search, they must have "arXiv class:" prepending the term. This would not be apparent to a new user of the system and could cause confusion. Trying to use key words from a full record in a search without that field definition can result in no records being retrieved or completely different records being retrieved. A list of key words is also provided as a limiter in the search results. Using the key words provided by the filter gives predictable results that can be replicated. The disconnect between the key words in the full records versus those provided as a filter is unexpected and a drawback to the system.

ADS provides a powerful new tool for visualizing the connections between citations, papers, authors, and unique or frequently occurring terms within search results. By selecting Explore above the search results, visualizations are created that can take the top 200 most published authors and look at collaborations between them. This lets a researcher focus results on a particular author or a particular group

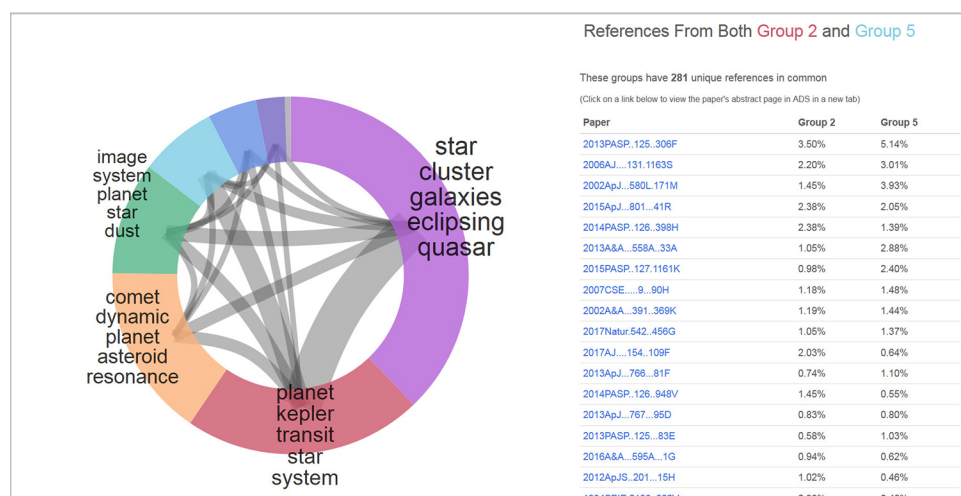


FIGURE 5 ADS Explore Search Results Option

easily. The paper visualizations allows a person to focus on papers with shared references. It can also point out relevant papers that are not in the initial search results. The word clouds can help researchers find other related terminology to use in searches (see Figure 5). The visualizations of papers and authors are unique to ADS and provide researchers with a new way to engage with their topic.

Competitive Products

There are truly no direct competitors to the Astrophysics Data System. There are other resources that could be searched, but none are as comprehensive nor provide the historical archives that are available through ADS. In terms of subscription databases, Compendex could be considered a competitor, but its focus is primarily on applied physics and engineering. It does not truly cover astronomy or astrophysics. The Web of Science Core collection does include astronomy and physics but does not have the depth of coverage provided here. All 66 of the journals included in the Journal Citation Reports from ISI are indexed and abstracted within the Astrophysics Data System along with about 4,260 other publications.

arXiv from Cornell University is the closest open source competitor, but its focus includes physics, mathematics, computer science, quantitative biology, finance, and engineering not astronomy. According to Tsay, et al. (2017), ADS actually provides a more complete bibliographic record of physics than arXiv.

The Astrophysics Data System is a truly unique product whose impact on the field of astronomy research has been the focus of several articles.

Purchase & Contract Provisions

SAO/NASA Astrophysics Data System is freely available to everyone. It is operated under NASA Cooperative Agreement NNX16A-C86A (SAO/NASA, n.d.).

Authentication

There is no authentication needed.

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Free Text Keywords: astronomy | astrophysics | space physics | physics | geophysics

Primary Category: Science, Technology, Computers, Engineering (including Environment), Mathematics

Type of product: Abstracting & Indexing; Aggregator database; Data sets

Target Audience: Undergraduate (including community colleges); Graduate/Faculty/Researcher

Access: Open Access (OA)

Contact Information

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60 Garden Street
Cambridge, MA 02138

E-mail: <adshelp@cfa.harvard.edu>

Producer URL: <<https://www.cfa.harvard.edu/sao>>

Product URL: <<http://ads.harvard.edu/>>



SAO/NASA Astrophysics Data System

Review Scores Composite: ★★★★★ 1/2

The maximum number of stars in each category is 5.

Content: ★★★★★

The most comprehensive bibliographic collection of astronomy and astrophysics resources available with over 13 million records providing historical and current coverage.

User Interface/Searchability: ★★★★★

Powerful search engine with a variety of fielded searches as well as an easy to use search interface. Visualizations provide a new way to interact with search results.

Pricing: N/A

Purchase/Contract Options: N/A

Kurtz, Michael J., Guenther Eichhorn, Alberto Accomazzi, Carolyn S. Grant, Stephen S. Murray, and Joyce M. Watson. 2000. "The NASA Astrophysics Data System: Overview." *Astronomy and Astrophysics Supplement Series* 143 (1): 41–59. <<https://doi.org/10.1051/aas:2000170>>

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About the Author

Laura Pope Robbins is the Associate Library Directory for Access Services at Embry-Riddle Aeronautical University, Prescott Campus. She holds an MBA in Information Systems Management from Dowling College and an MLS from the University of Washington. Her research interests include student-staff development, anime, copyright, and usability. ■