TOOLBOX

LOW-COST JOURNALS PIGGYBACK ON ARXIV

Peer-review platforms built around online preprint repositories spread to astrophysics.

ILLUSTRATION BY THE PROJECT TWINS

BY ELIZABETH GIBNEY

An astrophysicist has launched a low-cost community peer-review platform that circumvents conventional scientific publishing — and by making its software open source, he is encouraging scientists in other fields to do the same.

The *Open Journal of Astrophysics* works in tandem with manuscripts posted on the preprint server arXiv. Researchers submit their papers from arXiv directly to the journal, which evaluates them by conventional peer review. Accepted versions of the papers are then re-posted to arXiv and assigned a DOI, and the journal publishes links to them.

By piggybacking on, or 'overlaying', the arXiv repository, the journal should operate at a fraction of the cost of conventional publishers and will be free for both readers and authors, says journal founder and editor-in-chief, Peter Coles, an astrophysicist at the University of Sussex in Brighton, UK. He announced on 22 December last year that the journal was open for submissions. It will go live later this month, once its first papers have undergone review.

Development of the software that powers the journal's peer-review system was led by Arfon Smith, chief scientist at the popular code repository GitHub. Because the software is open source and available at GitHub, Coles hopes that researchers in other fields will adopt the same platform to create their own open journals. "Just cross out 'astrophysics' and write 'condensed matter' or anything else, and you've got your open journal," he says.

Similar overlay journals already exist in computer science and mathematics; Tim Gowers, a mathematician at the University of Cambridge, UK, launched one high-profile example, *Discrete Analysis*, last September. But the *Open Journal of Astrophysics* is thought to be the first of its type in physics. Gowers says that he is excited that the platform behind it is open source because "it potentially reduces the costs for others even further".

THE OVERLAY MODEL

Coles believes that conventional journals and their associated costs are no longer needed in fields such as astrophysics and cosmology, because most researchers already both submit their work to arXiv and read papers on it.

"The only objection to just putting things on arXiv is that it's not peer-reviewed, so why not have a community-based effort that provides a peer-review service for the arXiv?" he says — pointing out that academics already carry out peer review for scientific ▶

publishers, usually at no cost.

Coles himself covered the costs of developing the software platform for the journal, amounting to a few thousand pounds, he says. (*Discrete Analysis* licenses different software and is helped by a grant from the University of Cambridge.)

GitHub is covering the costs of hosting the platform, so the only remaining expense is editors' and reviewers' time, which they give voluntarily, says Coles. If the experiment proves successful and the volume of papers balloons, the journal may eventually have to charge authors a handling fee of a few tens of pounds, he adds. (The journal also relies on the continued existence of arXiv, whose running costs amount to less than US$10 per paper).

The journal does not have the resources to offer services provided by conventional journals, such as heavy editing of papers. Instead, poorly written articles will be rejected and the authors referred to a list of professional copy-editing services, Coles says.

GAINING TRACTION

Gowers welcomes the new journal; the arXiv-overlay model is much more likely to succeed, he says, if many examples of it can be seen to be working. The journal has amassed an editorial board with high-profile physicists including Pedro Ferreira, a theorist at the University of Oxford, UK, and Andrew Jaffe, a cosmologist at Imperial College London.

But astrophysicists will not necessarily jump to publish in Coles's journal. Ewine van Dishoeck, an astrophysicist at the Leiden Observatory in the Netherlands, says that she, for one, is unlikely to submit her work there. "We have a small number of well established and high-quality journals in astronomy that everyone respects," she says.

Papers in astrophysics are effectively open already, van Dishoeck points out, because anyone can view preprint manuscripts immediately on arXiv, whereas journals in the field make final accepted versions open after a delay — typically 12 months after publication. An issue for researchers can be slow peer-review of papers, she adds, but the *Open Journal of Astrophysics* has yet to prove that it can be faster.

Whatever their costs, the main problems facing all new journals hoping to achieve traction among researchers are ensuring speed and editorial fairness, adds Andrew King, a cosmologist at the University of Leicester, UK. "Reliability — and particularly fairness — are very hard to guarantee," he says, pointing out that the backing of long-lived organizations with a stake in the future of a field, such as learned societies, is often crucial to a journal's success. ■

Q&A Alice Allen
The code librarian

By day, Alice Allen runs software and IT training programmes for the Board of Governors of the Federal Reserve, the US central bank, in Washington DC. But in her spare time, she edits the world's largest registry for software in astrophysics and astronomy research — the Astrophysics Source Code Library (ASCL; ascl.net).

CHRIS MADDALONI/*NATURE*

How did you come to edit the ASCL?

I've always been interested in astronomy. So in 2010, I started doing volunteer work for the website Astronomy Picture of the Day. I told one of the site's creators — Robert Nemiroff, an astrophysicist at Michigan Technological University in Houghton, which hosts the ASCL — that I had time for another project. We talked about an effort that he and John Wallin (now at Middle Tennessee State University in Murfreesboro) had started in 1999, to create a repository of astrophysics source codes — the old ASCL. The resource had gathered about 40 source codes, but lay fallow at the time for want of an editor. I took it over and have been working on it ever since.

I work on the ASCL in my spare time and I take vacations to speak about it at conferences. It's an all-volunteer organization: we have two developers and an associate editor, Kimberly DuPrie, a programmer at the Space Telescope Science Institute in Baltimore, Maryland. The advisory committee is made up of astrophysicists who do this because they think it's a good idea. There's a lot of passion around this project.

Why is the site important?

It increases the discoverability of code used in research. Like many other sciences, astrophysics has become more dependent on software. And as software use has increased, the transparency and reproducibility of the science has decreased — you can read a paper and may not be able to see the source code that enabled the results. The ASCL holds nearly 1,200 records of source codes that have been used in research in peer-reviewed publications. Each entry is citable with a unique ID and points to a website where the code can be downloaded; entries include a description of the code, its authors and some of the research it appears in. We also house some source codes. The site got more than 100,000 hits in 2014. It provides a way for journals to point to a software record — it has been cited more than 500 times since 2012, according to NASA's Astrophysics Data System Abstracts Service.

How do entries get added to the library?

For the majority of entries, Kim and I look through research papers specifically to find codes to register, and we e-mail the authors; we know that coders won't necessarily think to register their codes with the ASCL. But since a site redesign in 2014, about 40% of the listings have come from scientists submitting their own entries, which we verify. We don't look at the quality of the code, but it has to meet our criteria, such as being used in research and immediately available to download.

If a link goes bad, we track down the code's new home. Journals don't have to worry about references to websites going stale: their links will stay good because they point to the ASCL.

How is it funded?

It's mostly unfunded. We have in the past received a few thousand dollars to cover things like conference presentations and poster production costs, from organizations such as the American Astronomical Society and the Heidelberg Institute for Theoretical Studies in Germany. Sometimes my travel to conferences is funded, but often it is not. Over the long term, the goal is to make the ASCL financially stable, although a large part of it will always be volunteer-based.

Do other science disciplines have equivalent code libraries?

There are lots of code registries and repositories online, but they're usually not science-specific. We index codes that are useful specifically in astronomy and astrophysics. There isn't one site for all science codes, and maybe there should be.

I've had several people approach me about creating a similar resource for physics. So last December, we started offering clones of the ASCL infrastructure (which runs using open-source software) to any discipline that wants to build a code registry of its own. A sample site is at scicodes.net, and Michigan Technological University is willing to host other science-code registries for three years if people would like. Nobody has taken us up on this offer yet, but they are welcome to try it out. ■

BY JEFFREY M. PERKEL

This interview has been edited for length and clarity.