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Codes of honour

A new regular column, Access Code, makes its debut in this issue. Access Code will focus on computational astrophysics, and in particular the models and programs that have supported astrophysical discoveries over the past few decades.

Our August issue introduces a new column to *Nature Astronomy*: Access Code. It is our first new column since *Nature Astronomy* launched. Seven years ago, just prior to launch, we created the Mission Control column to focus on interesting and timely missions, instrumentation, telescopes, spacecraft and technology. These things are often essential to our work as astronomers, but they are rarely raised to a high profile in broader-scope journals — this was one of the aims of Mission Control. And Mission Control achieved that goal: for example, the article on the Tianwen-1 mission (*Nat. Astron.* **4**, 721; 2020) has been accessed on more than 21,000 occasions and has been cited more than 60 times. Access Code shares the same aim as Mission Control, but the subject matter is very different. Rather than hardware, Access Code will shine the spotlight on software. In particular, Access Code will highlight the workhorse computational models and programs that have underpinned many of the astrophysical discoveries since the birth of modern computing.

Access Code takes the form of a short interview with (one of) the code developer(s), asking them about the initiation, development and future of their codes, and there is also an opportunity to highlight any notable scientific advances that have come as a result of applying their model. The inaugural article features Cloudy and its creator, Gary Ferland. Cloudy came into existence in 1978 as a tool to interpret ultraviolet spectra of quasars. Forty-five years later, Cloudy can now do so much more than it originally could, across a huge range of physical parameter space — even including modelling stellar atmospheres! This progress has come through the dedicated hours of development by Ferland and collaborators. Cloudy is cited ~300 times per year, and has featured in several hundred papers from Ferland alone.

There are many codes like Cloudy, which started life when computers first became useful and affordable, and have been developed and maintained by someone from the baby boomer generation now gracefully transitioning into retirement. What is the future of such codes, which have supported astrophysical discovery for decades? It is an important question for the community to resolve. Open source will presumably play a key role. Open-source software is beneficial not only for the reproducibility of science, but also for the longevity of codes like Cloudy. When US federal funding was pulled from IRAF (the stalwart data reduction software for optical and infrared observations), it was ported to GitHub in 2017 and the community rose to the challenge of maintaining and developing it, on a voluntary basis. But whereas IRAF was eventually a good news story, there will undoubtedly be other codes that will fall into obscurity because of a lack of reliable or sufficient funding or the lack of a champion to take the project forward. Grant-based funding is not a satisfactory solution for such long-lived projects, and as with laboratory astrophysics support for new observatories and missions and data infrastructure support for data archives, there should be a longer-term solution to provide support for computational astrophysics projects to ensure that years of investment are not wasted. The US Decadal Survey on Astronomy and Astrophysics 2020 makes a similar point: “Despite the increasing importance of software development and developers for the advancement of the field, neither are sufficiently funded or supported by existing structures […]. Funding for software maintenance and for open-source software projects, which have been transformative for astronomical science over the past decade, could pay major dividends in the future.”

Access Code will strive to shine a light on lynchpin codes and models that the astronomy community relies upon so heavily, as well as their software developers (“perhaps better called ‘software instrument builders’”; ibid.). With software featuring more prominently than ever before within our pages, we hope that funding bodies will take note, and provide longer-lived support for software development alongside the funding they offer for hardware development.

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