TAMING THE WORKFLOW
The open-access platform IPython

In 2001, as a final-year PhD student in theoretical physics, Fernando Perez started on a side project. For his research on quantum field theory, he needed to bring together his hotchpotch of computer code and data-analysis tools. Using a programming language called Python, he created IPython (ipython.org), an open-source, integrated platform that allowed him to type code, run his analyses, plot and visualize his data and add rich graphics within a single system.

"When I started working on IPython I told myself and my adviser that this was just going to be an afternoon hack and that I would get back to 'real work' very soon," he says. Some 13 years later, Perez is a computational scientist at the Brain Imaging Center at the University of California, Berkeley, and he develops IPython for computational science, publication and education across domain disciplines as his full-time job.

In 2011, he, along with collaborator Brian Granger at California Polytechnic State University in San Luis Obispo and their colleagues, added in a web-enabled notebook, which has been rapidly adopted by computational scientists working in the fields of biology, physics and neuroscience. It functions like a word processor, with normal text and formatting, but also enables users to insert programming language and rich graphics and data analyses, and easily go back and forth between them. "It's like having a very powerful calculator in the middle of your word processor that can do anything programming language can do," says Perez.

Researchers have even begun to publish papers directly from IPython, says Perez. The University of California, Berkeley, offers courses in IPython, and Harvard University and the Massachusetts Institute of Technology in Cambridge, and Columbia University in New York, among others, have adopted it.

The National Center for Ecological Analysis and Synthesis at the University of California, Santa Barbara, runs workshops on collaborative synthesis and data-sharing for graduate students and postdocs. And short, on-site workshops by a worldwide volunteer group called Software Carpentry offer hands-on training in Python, R, GitHub and other data-synthesis programs at various locations. **A.M.**

on Twitter, and links them together in an openly accessible, easily updatable, digital workflow. "A living paper is alive in that it gets updated and it reflects the ongoing process," says Boettiger. It allows scientists to document their entire scientific process, which they — and whomever they choose to share it with — can add to and derive new ideas from, says Matthew Jones, an expert in informatics at the National Center for Ecological Analysis and Synthesis at the University of California, Santa Barbara.

PRESERVED FOR POSTERITY
All these records must be stored, and archiving not only data and computations, but also intellectual discussions, presents challenges. Boettiger links his Twitter feed to his open notebook, and generates a running online tab of his reading and notes through the Mendeley reference manager. "Our literature has expanded so rapidly that other people are often our best sources of being able to figure out what to read," he says. Peter Andras, a computer scientist at Newcastle University, UK, also logs his reading through Mendeley and encourages his students to do the same.

But web-based resources often decline in popularity and if that happens, the record can languish unseen, or potentially even be lost. FriendFeed, for example, a hybrid between Twitter and Facebook, had a healthy researcher following in 2010 but now has substantially fewer users. Phillip Lord, a bioinformatician and a collaborator of Andras, says that for security he archives digital files through both archive.org, a general web repository, and an initiative at the British Library in London. Archiving services act as networks of libraries, storing data in multiple places to ensure that if one copy were lost or destroyed, it could be retrieved elsewhere.

Such challenges make it difficult to maintain electronic and open notebooks — but they are unlikely to stop their increasing adoption. "We're moving away from the science that we can document with a pen and paper to the science that we do in six different venues on instruments and with GPSs and laptops and paper and pen," says Strasser. "How do we capture that? It's super hard." Even so, the advantages are hard to ignore. "The days of paper lab books," Lord says, "are well past their best." ∎

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Gender differences

Women are less successful than men in getting grants from Research Councils UK (RCUK), according to an 11 March report from the umbrella body for the UK government's research councils. RCUK's first such analysis compared the annual success rate during 2010–13 of grant applications from women and men in eight age groups. Across all age and grant categories, women averaged a 25% success rate, compared with men's 29%. Iain Cameron, head of research careers and diversity at RCUK, says that the reason for women's lower success is not clear. One council is launching unconscious-bias training for peer reviewers, and RCUK may do a follow-up analysis. "The point of publishing these data is to expose them," Cameron says.

Swiss frozen out

Early-career researchers in Switzerland will have limited access to the Erasmus Plus student-exchange programme and other European research funds for the next academic year. Switzerland lost its status as an Erasmus Plus programme country after it voted to impose quotas on immigrants from European Union (EU) countries that restrict the free movement of people from Croatia, the newest EU member. The change means that Swiss nationals who wish to study in the EU will no longer be eligible for Erasmus grants and that students from eligible countries will not be able to obtain an Erasmus grant to study in Switzerland. Erasmus funds around 7,000 exchanges a year between Switzerland and other countries.

Public boost

Pay rises were slightly higher for faculty members at US public institutions (2.2%) than at private institutions (2.0%) for the first time since 2009, finds the College and University Professional Association for Human Resources (CUPA-HR) in Knoxville, Tennessee. The change suggests an overall strengthening of state economies, says Andy Brantley, CUPA-HR president. CUPA-HR's poll of 792 institutions and 180,000 faculty members also showed that compensation for tenure-track and tenured faculty members across both university categories rose by an average of 2.1% this academic year, the same increase as the year before.