works on the project. "It's brilliant."

By testing wind-flow models against the detailed data from Perdigão, researchers will be able to apply their findings in other locations. "Lessons learned will translate into improved atmospheric models for the entire wind-energy community," says Sonia Wharton, a meteorologist at the Lawrence Livermore National Laboratory in Livermore, California.

Europe gets 11% of its total energy from wind. But just a 10% shift in wind speed can change the amount of energy produced by up to 30%, says Jakob Mann, a wind-energy researcher at the Technical University of Denmark near Copenhagen. And losses are greatest in hilly or forested regions. Mann leads the €14-million (US$14.9-million) New European Wind Atlas project, a collection of wind-mapping studies and experiments of which the project in Portugal is the largest.

A pilot experiment by the Perdigão team in 2015 found turbulence downwind of one ridge that affected wind patterns on the next — the sort of detail that can improve models of atmospheric flow, says José Laginha Palma, a wind-energy specialist at the University of Porto in Portugal and head of the project.

Such models have typically relied on measurements from a simpler field experiment based on and around a hill in Askervein, UK, in the 1980s. "We're going to update and replace data going back 30 years," says Palma.

Portugal has a well-developed wind industry, and the Perdigão ridges already host one turbine. Winds at the site generally sweep across and down two steep ridges at around 8 metres per second — but they can blow at up to 40 metres per second. One recent burst blew the door off a temporary office trailer on one of the ridges. Knowing where such gusts occur can help turbine engineers take advantage of the steady winds while avoiding damage by the biggest gusts, says Rebecca Barthelmie, a wind engineer at Cornell who is working at the site.

Much of the scientific equipment is already up and running, and researchers will install the rest throughout February. The set-up includes 54 masts outfitted with instruments to measure wind speed, direction, temperature, humidity and other factors, both along and perpendicular to the ridges, 20 times per second. And 22 instruments will study small-scale wind flow in three dimensions using the laser-based technique lidar.

Many studies have looked at wind patterns on the scale of 1 kilometre, but the Perdigão experiment is the first to push large-scale wind mapping down to resolutions of 100–500 metres, says Harindra Fernando, a fluid-dynamics engineer at the University of Notre Dame in Indiana.

He is co-leader of the US researchers working at Perdigão, who are funded with $3.4 million from the National Science Foundation. "What we are trying to do is portable to anywhere in the world," he says. ■

PUBLISHING

Funders call for bio-preprints hub

Biomedical scientists argue for centralized server.

BY EWEN CALLAWAY

Life scientists keen to share their findings online before peer review are spoilt for choice. Whereas physicists gravitate to one repository — the 'preprint' server arXiv — life sciences has a fast-growing roster of venues for preprints. There's the biology-focused bioRχiv, and a biology section on arXiv too. But other sites have sprung up in the past year, or soon will, and these, too, provide opportunities for life sciences: ChemRxiv for chemistry; psyArXiv for psychology; even AgriXiv for agricultural sciences and paleorXiv for palaeontology.

Now, a coalition of biomedical funders and scientists is throwing its weight behind a 'one-stop shop' for all life-sciences preprints — a move that its backers argue should clarify any confusion and make it easier to mine the preprint literature for insights.

On 13 February, ASAPbio, a grass-roots group of biologists that advocates for preprints, issued a funding call to build a central preprint site. The US National Institutes of Health (NIH), the Wellcome Trust and several other leading funders also announced their support for the concept.

"The landscape could become fragmented very quickly," says Robert Kiley, head of digital services at the London-based Wellcome Trust. "We want to find a way of ensuring that, although this content is distributed far and wide, there's a central place that brings it all together."

The details of the service are inchoate: its scope will depend on specific scientific fields and their funders, says Jessica Polka, the director of ASAPbio. But as well as aggregating content from other biology-focused preprint sites, ASAPbio wants the site to mesh with arXiv and with ChemRxiv, which the American Chemical Society in Washington DC plans to launch soon.

ALL YOUR PREPRINTS HERE

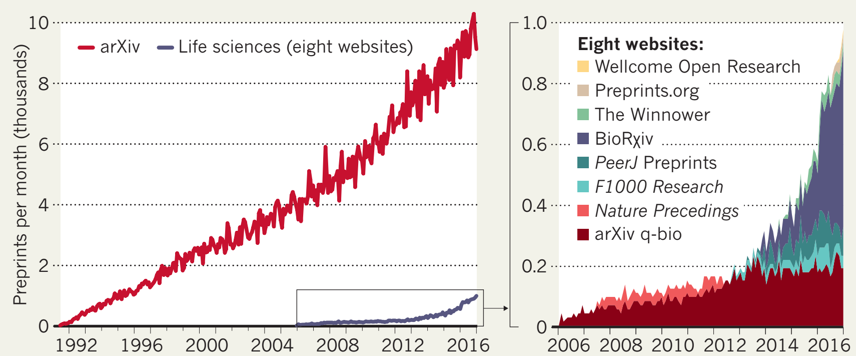
Proponents hope that a central site will lure biologists to embrace preprints as wholeheartedly as physical scientists have. Physics manuscripts routinely appear at arXiv.org months before publication in peer-reviewed journals, as researchers race to release their findings online before their rivals. And preprints are now accepted currency in determining priority for a discovery, as well as in winning grants and jobs. ArXiv handles more than 100,000 manuscripts each year in physics, mathematics and computer science, whereas the largest life-sciences preprint server, bioRχiv, posted around 5,000 manuscripts in 2016 (see 'Preprints on the rise').

"One of the lessons of arXiv is that users prefer 'one-stop shopping'," says Paul Ginsparg, a theoretical physicist at Cornell University in Ithaca, New York, who founded the site in 1991.

A central preprint service could also help scientists use automated software to mine the literature for insights, says Ron Vale, a cell biologist at the University of California, San Francisco, and a founder of ASAPbio. At the moment, researchers who want to mine ▶

PREPRINTS ON THE RISE

Life scientists are increasingly posting preprints online, although the much older arXiv server attracts ten times as many preprints, mostly in physics, computer science and mathematics.



SOURCE: ARXIV/PREPUBMED/BIORXIV

peer-reviewed papers face myriad hurdles, from publisher copyrights to disparate websites that make bulk-downloading difficult. “We’re trying to think of preprints as data,” says Vale. It would be both technically and legally straightforward for computers to crawl through the collection of preprints on the central site, where they would appear under an open-access licence.

Polka would not say how much ASAPbio expects the site to cost, but arXiv funding totals about US$925,000 a year, paid for by a global collective of more than 200 research institutions and funders. Ginsparg says expenses for the life-sciences site should be around $5 a manuscript, once it is publishing tens of thousands of manuscripts each year. Funders who support the site have not yet committed to paying for it, but Kiley expects that they will do so once details have been hammered out.

Other funders that have come out in support of the central service include the UK Medical Research Council, the Howard Hughes Medical Institute (HHMI), the Canadian Institutes of Health Research and the European Research Council. “That’s going to send a strong message to the science community that this kind of communication is encouraged,” says Vale.

CULTURAL CHALLENGE

Jason Hoyt, chief executive of the journal *PeerJ* (which also operates a preprint service), says he supports a central preprint site and that his company might bid to help create it. But such a site will succeed only if it can induce a large proportion of life scientists to view preprints as the dominant currency for career progression, he says. “The challenge is to overturn the thinking in biology.”

ASAPbio and the funders supporting a central preprint service emphasize that it’s no replacement for peer-reviewed journals. They note that the vast majority (more than 80% in some fields) of arXiv posts wind up in journals. “We really see this as a complement to the journal system, rather than anything that could be threatening,” says Polka, who adds that a central service will not attempt to organize peer review.

That would be a missed opportunity, says Rebecca Lawrence, managing director of London-based *F1000Research*, which posts papers before they are peer reviewed (but does not consider these as preprints). She would like to see peer review occur through a central preprint service, thereby reducing the influence that traditional journals have on scientists’ careers.

“It’s a great shift in the right direction,” she says, “but I think we need to go a lot further.” ■

CHEMISTRY

Elusive triangulene created by moving atoms one at a time

Researchers used microscope tip to make unstable hydrocarbon with ‘molecular surgery’.

BY PHILIP BALL

Researchers at IBM have created an elusive molecule by knocking around atoms using a needle-like microscope tip. The flat, triangular fragment of a mesh of carbon atoms, called triangulene[1], is too unstable to be made by conventional chemical synthesis, and could find use in electronics.

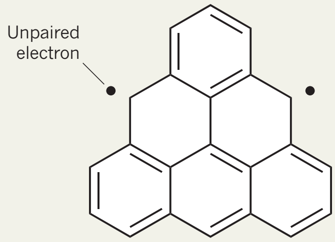
This isn’t the first time that atomic manipulation has been used to create unstable molecules that couldn’t be made conventionally — but this one is especially desirable. “Triangulene is the first molecule that we’ve made that chemists have tried hard, and failed, to make already,” says Leo Gross, who led the IBM team at the firm’s laboratories in Zurich, Switzerland.

The creation of triangulene demonstrates a new type of chemical synthesis, says Philip Moriarty, a nanoscientist who specializes in molecular manipulation at the University of Nottingham, UK. In conventional synthesis, chemists react molecules together to build up larger structures. Here, by contrast, atoms on individual molecules were physically manipulated using a microscope.

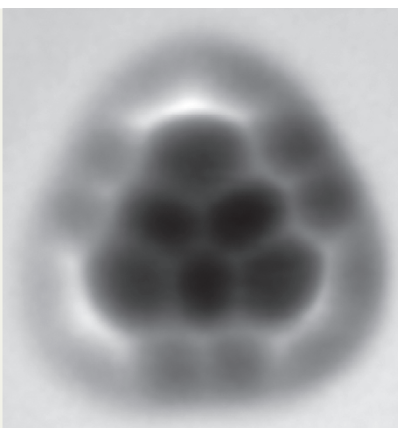
But making molecules one at a time will be useful only in particular situations. And the method is unlikely to work for those with complicated shapes or structures.

RADICAL TRIANGLE

Triangulene is a flat molecule made up of a hexagonal mesh of carbon and hydrogen atoms (left). IBM researchers made the molecule by manipulating atoms with a scanning probe microscope, and then imaged it (right).



Hydrogen atoms on each corner not shown.



SOURCE: REF. 1

Triangulene is similar to a fragment of graphene, the atom-thick material in which carbon atoms are joined in a hexagonal mesh. The new molecule is made up of six hexagons of carbon joined along their edges to form a triangle, with hydrogen atoms around the sides (see ‘Radical triangle’). Two of the outer carbon atoms contain unpaired electrons that can’t pair up to make a stable bond.

Such a molecule is highly unstable because the unpaired electrons tend to react with anything around them. “As soon as you synthesize it, it will oxidize,” says Niko Pavliček, a member of the IBM team. So far, the closest conventional synthesis has come to making molecules of this sort involves buffering the reactive edges with bulky hydrocarbon appendages[2].

The IBM team turned to a scanning probe microscope, which has a needle-sharp tip that ‘feels’ a material’s shape. The technique is usually used to image molecules, by measuring attractive forces between the tip and sample, or the electric currents that pass between them. The IBM team has shown[3] that, if the tip has a small molecule such as carbon monoxide attached to it, force microscopy can provide images of such high resolution that they resemble the ball-and-stick diagrams of chemistry textbooks.

Gross’s team has already demonstrated[4]