remain in the country from the most recent Ebola outbreak, which ended in July, and more doses are on the way. The DRC will need a larger vaccine supply now, because the strategy deployed during the previous outbreak will not work for the current one.

During the previous outbreak — which lasted three months — officials vaccinated health workers, people who had had direct contact with someone with Ebola and the contacts of those contacts. But the instability in North Kivu and Ituri has made tracking such connections difficult. In towns where people have been infected but officials can't track down their contacts, workers might vaccinate the entire community instead, says Socé-Fall.

An inability to track these connections worries epidemiologists because people on the move spread the virus. Humanitarian groups estimate that this year, nearly 750,000 people in North Kivu and Ituri have fled from militia fighters. And about one million refugees displaced from their homes by the violence over at least the past decade continue to travel frequently between cities in the region. Some refugees migrate to neighbouring countries such as Uganda, Rwanda and Burundi.

Aid agencies must now consider how to get into these conflict zones to fight Ebola without endangering their staff. Workers might travel with armed security escorts provided by the DRC government for their protection, said Peter Salama, the WHO's head of emergency preparedness and response, at a press briefing on 3 August.

But a key organization fighting Ebola in the area, Médecins Sans Frontières (MSF, also known as Doctors Without Borders), hesitates to use that approach. The group feels that travelling with armed escorts hinders its ability to help people of various political affiliations, says Salha Issoufou, the head of MSF's operation in DRC. So MSF will forgo the escorts.

The next phase of the response by the WHO, the DRC government and aid groups will be to use experimental drugs to treat people who have Ebola. A national review board that evaluates research ethics has approved the use of these treatments, and Steve Ahuka, a virologist at the National Institute for Biomedical Research based in Kinshasa, says that some therapeutics have just arrived in the region.

One treatment is an antibody called mAb114, which was manufactured by the US government. Others include the antiviral drugs Favipiravir (T-705), made by Japanese company Toyama Chemical, and Remdesivir (GS-5734), produced by Gilead, based in Foster City, California.

"Thanks to our experience from the previous outbreak, we are prepared," says Ahuka. ■

Jason Priem (left) and Heather Piwowar co-founded Impactstory, which launched Unpaywall in 2016.

BRIAN GLANZ/OPEN SCIENCE FED./CC BY

DATA ACCESS

The rise and rise of Unpaywall

Non-profit is a gift to many academics — and tie-ins with established scientific search engines could broaden its reach.

BY HOLLY ELSE

After being kicked out of a hotel conference room where they had participated in a three-day, open-science workshop and hackathon, a group of computer scientists simply moved to an adjacent hallway. There, Heather Piwowar, Jason Priem and Cristhian Parra worked all night on software to help academics see how much of their work was freely available on the Internet. They realized how much time had passed only when they noticed hotel staff starting to prepare for breakfast.

That all-nighter, back in 2011, laid the foundation for Unpaywall. This free service locates open-access articles and presents paywalled papers that have been legally archived and are freely available on other websites to users who might otherwise have hit a paywalled version. Since one part of the technology was released in 2016, the service has become indispensable for many researchers. And firms that run established scientific search engines are starting to make good use of Unpaywall.

On 26 July, Elsevier announced plans to integrate Unpaywall into its Scopus database searches, allowing it to deliver millions more free-to-read papers to users than it does currently. Scopus's embrace of Unpaywall, along with similar moves by other search engines, means that much more open-access content is now at researchers' fingertips. These deals are also enabling funders, librarians and others to study open-access publishing trends comprehensively for the first time.

"Unpaywall is a groundbreaking development," says Alberto Martín-Martín, who studies bibliometrics and science communication at the University of Granada in Spain. "It takes us one step closer to achieving a true open research infrastructure."

After participating in the 2011 hackathon, Piwowar and Priem founded a non-profit organization called Impactstory, in Vancouver, Canada, where they refined Unpaywall. (Parra is now a consultant at the World Bank in Asunción, Paraguay.)

"Unpaywall is a groundbreaking development. It takes us one step closer to a true open research infrastructure."

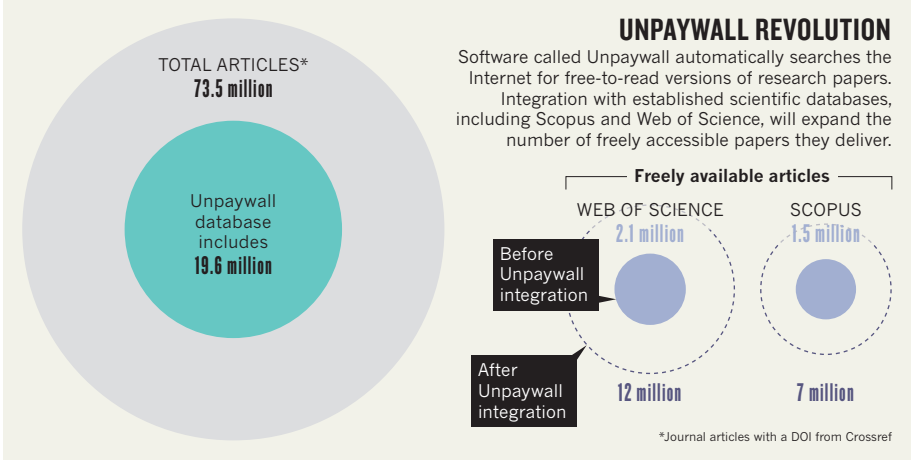
Research by Priem and Piwowar published as a preprint in August 2017 — using Unpaywall, naturally — suggests that almost half of the recent research papers that people search for online are available for free (H. Piwowar *et al.* Preprint at *PeerJ Preprints* https://doi.org/10.7287/peerj.preprints.3119v1; 2017). But, says Priem, "there is a terrific gap between the availability and discoverability" of these papers, and it is this problem that Unpaywall hopes to solve.

Unpaywall consists of a database that includes a list of almost 20 million freely available scholarly articles. Most researchers access it using a free browser plug-in that was released in 2017. In June 2017, Unpaywall was integrated into a popular science search engine called Web of Science, which is operated by Clarivate Analytics. Dimensions, a service run by Digital Science that launched this year, used Unpaywall from the start. These companies, and now Elsevier, pay a subscription fee for a feed of Unpaywall's database that is updated weekly. Impactstory also offers free access to the Unpaywall database (updated twice a year for non-subscribers).

Since its launch, Unpaywall's technology has also been integrated into many university-library discovery systems, so that users can easily find freely available versions of research papers in institutional repositories. These archives, which are operated by universities, funders and others, host the lion's share of articles in Unpaywall's database, but were difficult to search systematically in the past.

Scientists using Scopus can filter their results to find freely available papers, but the database links to only about 1.5 million papers published in fully open-access journals. Once Unpaywall's integration is complete in November 2018, searches carried out on Scopus for free-to-read literature will also find articles on publisher platforms, even if the journal publishes a mix of open-access and paywalled articles.

This will boost the number of freely available articles in Scopus to 7 million, which is still around 13 million articles fewer than are listed in Unpaywall's database (See 'Unpaywall revolution'). This gap exists because Scopus will not initially link to articles posted in repositories.



SOURCE: CROSSREF/UNPAYWALL/IMPACTSTORY/ELSEVIER/CLARIVATE ANALYTICS

NEW FRONTIERS

Large citation databases such as Scopus and Web of Science list the majority of all research articles. By integrating their records with Unpaywall data, researchers can systematically measure the proportion of the literature that is freely available — a feat that wasn't previously possible. The US National Institute of Mental Health (NIMH), which has an overall budget of around US$1.5 billion, is working with Impactstory to develop a bespoke tool that uses Unpaywall. The agency's goal is to determine the extent to which researchers working at NIMH laboratories in Bethesda, Maryland, and nearby Rockville are making their papers, data and source code freely available.

For Priem, making Unpaywall a go-to tool for researchers is just the start. Last month, Impactstory secured an $850,000 grant to create a search engine aimed at non-scientists. It will also use artificial intelligence to summarize journal articles in its database in plain language, so that non-specialists can understand them. "20 million articles are free for everyone to read but might as well be closed if there is no way for any average person to access it," he says. "We're not yet finished." ■

DRUG DEVELOPMENT

Gene-silencing drug approved

US government okays first RNA-interference drug — after a 20-year wait.

BY HEIDI LEDFORD

US regulators have approved the first therapy based on RNA interference (RNAi), a technique that can be used to silence specific genes linked to disease. The drug, patisiran, targets a rare condition that can impair heart and nerve function.

The approval, announced by the US Food and Drug Administration on 10 August, is a landmark for a field that has struggled for nearly two decades to prove its worth in the clinic. Researchers first discovered RNAi 20 years ago (A. Fire *et al. Nature* **391**, 806–811; 1998), sparking hopes of a revolutionary new approach to medicine. Since then, however, a series of setbacks has lessened those expectations.

"This approval is key for the RNAi field," says James Cardia, head of business development at RXi Pharmaceuticals in Marlborough, Massachusetts, which is developing RNAi treatments. "This is transformational."

Patisiran works by silencing the gene that underlies a rare disease called hereditary transthyretin amyloidosis. In that illness, mutated forms of the protein transthyretin accumulate in the body, sometimes impairing heart and nerve function.

The drug's approval means that pharmacology textbooks will need to be rewritten, says Ricardo Titze-de-Almeida, who studies RNAi at the University of Brasilia. "We are inaugurating a new pharmacological group," he says. "We will have many more such drugs in the coming years."

This was the hope when Alnylam, the company in Cambridge, Massachusetts, that developed patisiran, launched in 2002. Four years later, the Nobel Prize in Physiology or Medicine was awarded to two RNAi pioneers: Andrew Fire of Stanford University School of Medicine in California and Craig Mello of the University of Massachusetts Medical School in Worcester.

But to make RNAi into medicine, developers would first need to determine how to deliver delicate molecules of RNA safely to their target organs. They needed a way to shield the RNA from degradation in the bloodstream, prevent it from being filtered out by the kidneys, and allow it to exit blood vessels and spread through tissues. "That proved to be a substantially harder problem than we anticipated," says Douglas Fambrough, chief executive of Dicerna, an RNAi-focused company in Cambridge, Massachusetts.

As researchers grappled with the delivery puzzle, investors began to lose confidence. In 2008, analyst Edward Tenthoff of investment bank Piper Jaffray in New York City advised his clients to stop buying Alnylam stock. "We saw the promise in the technology, but the delivery was lacking," he says. ▶