says Coudert. He had previously posted about the *Nature* story on Twitter; McNutt replied, urging him to take action.

"The NAS has chosen a policy that is very weak and that protects them in a way," says Coudert.

The academy has said in the past that it does not have the resources for formal investigations, apart from for internal NAS business. The group relies on publicly documented investigations carried out by other organizations to begin inquiries into its members.

The NAS informed Coudert of Marcy's termination last month; the chemist says it is a preliminary step in the right direction.

Membership of the highly selective NAS is regarded as a top honour in US science, burnishing the profile of elected members. It also confers a degree of influence — the group is regularly tapped by US agencies to offer scientific views on national affairs.

Seyda Ipek, a theoretical particle physicist at the University of California, Irvine, also submitted a complaint last September, including public details of harassment investigations and findings concerning Marcy. "It's really important to not allow these people in these prestigious communities, because they are doing bad things for science," says Ipek. She says she was surprised and angry to learn that scientists continued to collaborate with the astronomer, pointing out that manuscripts posted on the arXiv preprint server in the past six months still listed Marcy as a co-author. "Where is the justice for women pushed out of the field if people continue to work with him?"

Some of those papers point to Berkeley as Marcy's affiliation. A Berkeley spokesperson says that Marcy is currently a retired professor at the university, and that University of California policy allows retirees to refer to themselves as emeritus faculty members at those institutions. They added that the university's 2015 announcement of Marcy's resignation was accurate at that time.

"Where is the justice for women pushed out of the field if people continue to work with him?"

A spokesperson for the NAS confirmed that Marcy's membership had been rescinded as of 24 May. They did not say how many other members were under review as a result of sexual-harassment complaints.

HUNDREDS OF GIBBERISH PAPERS STILL LURK IN THE SCIENTIFIC LITERATURE

Nonsensical articles, spotted years after the problem was first seen, could lead to a wave of retractions.

By Richard Van Noorden

Nonsensical research papers generated by a computer program are still popping up in the scientific literature many years after the problem was first seen, a study has revealed. Some publishers have told *Nature* they will take down the papers, which could result in more than 200 retractions.

The issue began in 2005, when three PhD students created paper-generating software called SCIgen for "maximum amusement", and to show that some conferences would accept meaningless papers. The program cobbles together words to generate research articles with random titles, text and charts, easily spotted as gibberish by a human reader. It is free to download, and anyone can use it.

By 2012, computer scientist Cyril Labbé had found 85 fake SCIgen papers in conference proceedings published by the Institute of Electrical and Electronic Engineers (IEEE); he went on to find more than 120 fake SCIgen papers published by the IEEE and by Springer (C. Labbé and D. Labbé *Scientometrics* **94**, 379–396; 2013). It was unclear who had generated the papers or why. The articles were subsequently retracted — or sometimes deleted — and Labbé released a website allowing anyone to upload a manuscript and check whether it seems to be a SCIgen invention. Springer also sponsored a PhD project to help spot SCIgen papers, which resulted in free software called SciDetect. (Springer is now part of Springer Nature; *Nature*'s news team is editorially independent of its publisher.)

Labbé, who works at the University of Grenoble Alpes in France, originally searched manuscripts for words typical of SCIgen's vocabulary. But he and another computer scientist, Guillaume Cabanac at the University of Toulouse, France, came up with a new idea: searching for key grammatical phrases characteristic of SCIgen's output. Last May, he and Cabanac searched for such phrases in millions of papers indexed in the Dimensions database.

After manually inspecting every hit, the researchers identified 243 nonsense articles created entirely or partly by SCIgen, they report in a study published on 26 May (G. Cabanac and C. Labbé *J. Assoc. Inf. Sci. Technol.* https://doi.org/gj7b8h; 2021). These articles, published between 2008 and 2020, appeared in various journals, conference proceedings and preprint sites, and were mostly in the computer-science field. Forty-six of them had already been retracted or deleted from the websites on which they were first published.

Since last year, the researchers have added another 20 papers to their list, including gibberish articles created by MATHgen (software that generates mathematics papers) and the SBIR proposal generator (which creates nonsense grant proposals).

CV padding

Most of the latest batch of SCIgen papers were authored by researchers from China (64%) or India (22%), although Labbé notes that the manuscripts could have been submitted in anyone's name without their knowledge. One author of several of the papers told Labbé and Cabanac that he'd submitted them as hoaxes. But other manuscripts seem to have been edited with genuine reference lists, suggesting that they might have been generated to inflate scientists' citation counts. "I think the vast majority are created to pad CVs in order to fulfil a need to publish papers," says Labbé.

The researchers found only two SCIgen papers that hadn't been retracted at the IEEE — which is evaluating both of them — and one Springer paper that included a fragment of MATHgen text. But other publishers were caught out more badly. IOP Publishing, a subsidiary of the London-based Institute of Physics, says it retracted ten papers "as there was clear evidence they had been computer-generated", and is investigating why they weren't identified during peer review at the conference for which they were accepted. "We have reasonable evidence to suggest that the peer-review process for some of these papers was compromised," says Kim Eggleton, the publisher's integrity and inclusion manager.

The publishers that posted the most SCIgen content were Trans Tech Publications based in Bäch, Switzerland, which published 57 SCIgen papers; Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP), based in Bhopal, India, which had 54; and Atlantis Press, a Paris-based publisher that was acquired by Springer Nature this March, with 39. Both Trans Tech Publications and Atlantis told *Nature* that they were investigating and were in the process of retracting the articles, but a spokesperson

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for BEIESP said that it published only articles with original content that passed double-blind peer review and plagiarism checks.

The SSRN preprint server, where papers are shared before peer review, had published 16 SCIgen articles, the study found. A spokesperson for SSRN said it was investigating the issue, and noted that it provided "limited screening" for its preprints (with "advanced screening" for health-care manuscripts).

SCIgen papers are extremely rare: Labbé and Cabanac estimate from their screen that they make up a mere 75 papers per million in the computer-science literature. But, says Labbé, the existence of these papers is an indication of the harmful effects of a 'publish or perish' culture, and an example of how nonsensical work can still make it into conference proceedings or journals. "You shouldn't find these things in the literature," he says.

CHINA'S CORONAVAC JAB SET TO BOOST GLOBAL IMMUNIZATION CAMPAIGN

World Health Organization approves second of two Chinese COVID shots in use in more than 70 nations.

By Smriti Mallapaty

The World Health Organization (WHO) has approved a second Chinese vaccine for emergency use. CoronaVac was found to be 51% effective at preventing COVID-19 in late-stage trials, and researchers say it will be key to curbing the pandemic.

Its overall protection is lower than that provided by seven other vaccines already listed by the WHO. But, importantly, trials suggest that CoronaVac — an inactivated-virus vaccine produced by Beijing-based Sinovac — is 100% effective at preventing severe disease and death.

"CoronaVac will significantly contribute to the global fight against COVID-19 as a safe and moderately effective SARS-CoV-2 vaccine," says Murat Akova, a clinical researcher in infectious diseases at Hacettepe University in Ankara.

CoronaVac's approval, on 1 June, came about a month after the WHO listed another Chinese vaccine, made in Beijing by state-owned firm Sinopharm, which showed an efficacy of 79% against symptomatic disease. Both vaccines are already used widely around the world, and are driving China's massive internal immunization campaign.

CoronaVac is sustaining vaccination campaigns in more than 40 countries, including Chile and Botswana. Globally, more than 600 million doses have been delivered. Sinopharm's vaccine has been approved in many more nations. But WHO emergency approval could now facilitate the further distribution of both vaccines to low-income countries, through the COVID-19 Vaccines Global Access (COVAX) initiative.

EZRA ACAYAN/GETTY

China's CoronaVac vaccine is already in use in the Philippines, and many other countries.

A spokesperson for COVAX member Gavi, the Vaccine Alliance, in Geneva, Switzerland, says Gavi welcomes the news of the listing, "as this means the world has yet another safe and effective tool in the fight against this pandemic".

The WHO's efficacy estimate of 51% was based on data from late-stage trials among health-care workers in Brazil, posted online as a preprint in April (R. Palacios *et al*. Preprint at SSRN https://doi.org/ggjr; 2021). Of the 9,823 participants included in the analysis, 253 had COVID-19 — 85 in the vaccinated group and 168 among those who received the placebo. None of the vaccinated volunteers was hospitalized or died owing to COVID-19. Smaller, late-stage trials in Indonesia and Turkey have shown higher efficacies, of up to 84%.

Preliminary findings from a post-trial study of 2.5 million people in Chile estimated that CoronaVac was 67% effective at preventing COVID-19, and 80% effective at preventing death from the disease, despite the presence of the Alpha (B.1.1.7) and Gamma (P.1) variants of the virus SARS-CoV-2.

Preliminary results detailed at a press conference in Brazil last week, from a trial in the town of Serrana, suggest that CoronaVac could make a significant dent in the pandemic. The Butantan Institute in São Paulo conducted the study, in which almost the entire adult population of Serrana was vaccinated with CoronaVac. The vaccine significantly reduced cases of COVID-19, hospitalizations and deaths.

The fact that CoronaVac can protect an entire town, despite nearly 40% of the population commuting daily to areas where the pandemic was raging, is "remarkable evidence" that this vaccine could be "a game changer in controlling the pandemic", says trial leader Ricardo Palacios, medical director of clinical research at the Butantan Institute.

Both of the approved Chinese vaccines use established technology based on inactivated virus and can be stored at fridge temperatures, which makes them easy to distribute. But these kinds of COVID-19 vaccine seem to offer less protection against the disease than do mRNA vaccines, such as that made by pharmaceutical company Pfizer in New York City and biotechnology firm BioNTech in Mainz, Germany, and one made by biotech company Moderna in Cambridge, Massachusetts.

Researchers say this could be due to the technology itself. The vaccines use a killed version of SARS-CoV-2 to induce the human body to make antibodies against many regions of the virus. But only some of these antibodies are effective at disabling the virus, says

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