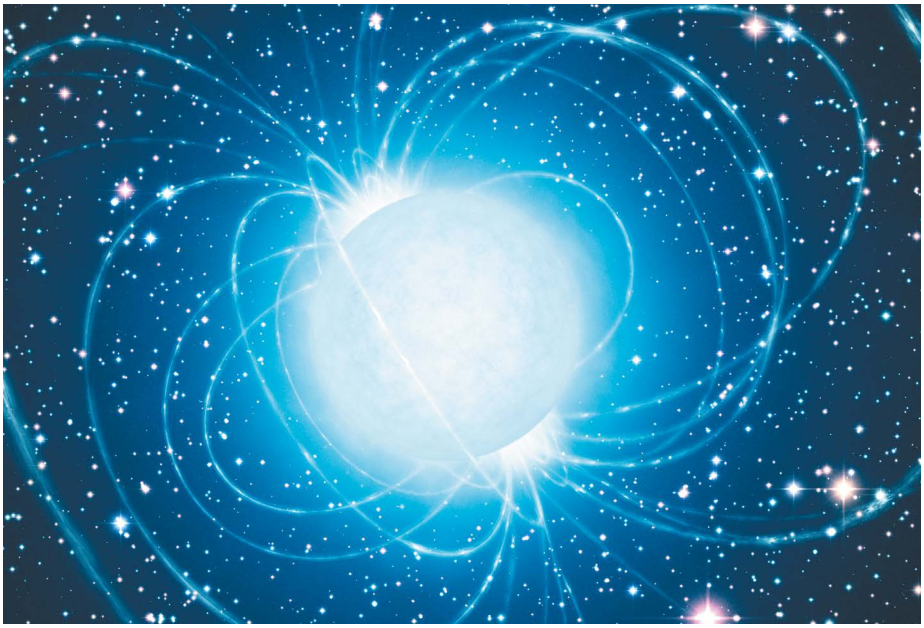

ESO/L. CALÇADA

An artist's impression of a magnetar.

radiation at different wavelengths. The next day, the Canadian Hydrogen Intensity Mapping Experiment (CHIME) radio telescope in Penticton, Canada, detected a huge radio flash occurring to the side of its field of view – from the place where the magnetar lay (The CHIME/FRB Collaboration. Preprint at arXiv https://arxiv.org/abs/2005.10324;2020).

The CHIME team had been hoping to pick up radio emission from SGR 1935+2154. But they were expecting faint radio pulses. Instead, "we got something much more exciting", says Paul Scholz, an astronomer at the University of Toronto who led the analysis.

A second research team got even luckier by catching the intense burst full-on. The STARE2 radio telescope is made of low-tech antennas – each consists of a metal pipe with two cake tins attached – at two locations in California and one in Utah. STARE2 has been observing the sky since last year, hoping to catch something resembling a fast radio burst in the Milky Way. On 28 April, it did exactly that, detecting the same radio pulse that CHIME saw (C. D. Bochenek *et al*. Preprint at arXiv https://arxiv.org/abs/2005.10828; 2020).

"I was so excited that it took me a little bit of time to open up the data and inspect it, to make sure it was real," says Chris Bochenek, a graduate student at the California Institute of Technology in Pasadena who works on STARE2.

Energy outburst

The radio flash is by far the brightest ever seen from a magnetar in the Milky Way, and could offer clues to what causes fast radio bursts seen elsewhere in the Universe.

Because magnetars are spinning quickly and have powerful magnetic fields, they have huge reservoirs of energy that can produce outbursts. One idea about the source of these outbursts is that something happening inside the magnetar – such as a 'starquake', analogous to an earthquake – could crack its surface and release energy. Another possibility is that the highly magnetized environment around the magnetar somehow produces the burst.

Astronomers might be able to narrow down these possibilities by studying both the radio burst from SGR 1935+2154 and bursts in other wavelengths of light that happened simultaneously, says Laura Spitler, an astronomer at the Max Planck Institute for Radioastronomy in Bonn, Germany. Several satellites detected X-ray bursts from the magnetar at around the same time as the radio emission. It is the first time astronomers have seen these signals in other wavelengths; seeing them was possible only because the magnetar is so close to Earth.

But some mysteries remain. For one thing, the 28 April burst was about 1,000 times less energetic than are fast radio bursts seen in distant galaxies. And some distant bursts repeat at intervals, which can't be easily explained by the bursts coming from a magnetar.

Astronomers still want to collect as many examples of fast radio bursts as they can. "Each serves as a kind of backlight shining through all the material between us and the source," says Jason Hessels, an astronomer at the University of Amsterdam. Scientists have recently started to use that information to map the distribution of matter in the Universe.

"There's an exciting future to the field," says Hessels, "even if this is more or less the answer to where the bursts are coming from."

INFLUENTIAL PANDEMIC SIMULATION VERIFIED BY CODE CHECKERS

Model shown to be reproducible after software engineers called the underlying code 'a buggy mess'.

By Dalmeet Singh Chawla

"Totally unreliable." "A buggy mess." Over the past month, software engineers have sharply criticized the code underpinning an influential coronavirus simulation by scientists at Imperial College London, one of several models that helped to sway UK politicians into declaring a lockdown. Some media articles even suggested that the simulation couldn't be repeated by others – casting further doubt on the study. Now, a computational neuroscientist has reported that he has independently rerun the simulation and reproduced its results.

The successful code testing isn't a review of the scientific accuracy of the simulation, produced by a team led by mathematical epidemiologist Neil Ferguson. But it dispels some misapprehensions about the code, and shows that others can repeat the original findings.

The new test is "the best possible verification of Ferguson's simulations given the state of the art in computational science", says Konrad Hinsen, a computational biophysicist at the French national research agency CNRS in Paris, who was not involved in the work. In May, he wrote in a blogpost that the study's code looked "horrible", but that such shortcomings are expected in code written by scientists who aren't specialists in software development.

Released in mid-March, the original study reported that there could be half a million UK deaths if nothing were done to stop the virus, and modelled how policy interventions might help (N. Ferguson *et al*. 'Report 9' http://doi.org/ggqtdx; 2020). But Imperial scientists did not make the code available for public scrutiny. When a cleaned-up version was released at the end of April, software engineers disparaged its quality and said the simulation needed to be repeated by others. Media articles cast further doubt on the work by reporting online comments suggesting that other scientists had problems rerunning the code.

Ferguson — who didn't comment on the criticisms at the time — agrees that the simulation didn't use best-practice coding methods, because it was adapted from a model created more than a decade ago to simulate an influenza pandemic. There was no time to generate new simulations of the same complexity from scratch, he says, but criticisms of the code didn't affect the science of the simulation.

The politicized debate around the Imperial code demonstrates why scientists might still hesitate to openly release the code underlying their work, researchers say: academic programs often have shortcomings that software engineers can pick at. Although some journals now ask peer reviewers to rerun and verify code, sharing it publicly is still far from an academic norm. The time researchers might have to spend either helping people use their software or refuting claims stemming from its misuse is a "big worry" among many academics, says Neil Chue Hong, founding director of the Software Sustainability Institute in Edinburgh.

> **"The test is the best possible verification given the state of the art in computational science."**

Even so, scientists ought to release their code and document how it works, says Stephen Eglen, the neuroscientist at the University of Cambridge, UK, who reran the Imperial code and reported his results on 1 June (go.nature.com/3fqihs8).

Reproducible software

This year, Eglen co-founded an organization called Codecheck to help to evaluate the computer programs behind scientific studies. His work tests whether it is possible to reproduce the results of a computational analysis, given its data inputs and code. He didn't review the epidemiology that went into the Imperial simulation — such as estimates of the fatality rate associated with the coronavirus. British science advisers, however, asked multiple teams to model the emerging pandemic, and they produced results similar to Imperial's.

Researchers working with London's Royal Society as part of the Rapid Assistance in Modelling the Pandemic (RAMP) effort have told *Nature* that they also privately ran exercises to verify the code in March. After the original Imperial study was posted online, RAMP researchers worked with Ferguson's team and software firms Microsoft and GitHub to clean up the software for public release on the GitHub website, a repository where developers (including scientists) share code. As part of this, they checked that the public and original code reliably produced the same findings from the same input.

The RAMP group's work included a separate effort to test the robustness of the simulation by trying to break it under various operating conditions, says Graeme Ackland, a physicist at the University of Edinburgh, UK. The team involved posted comments on GitHub as it went. It was these comments that newspaper articles erroneously quoted as casting doubt on whether the code could be reproduced.

Asked what he'd learnt from the furore over the code, Ferguson emphasized how fast the work had to be done. On 27 February, he presented basic estimates of the impact of the pandemic at a private meeting of the main UK scientific advisory group for emergencies; his figures already gave estimates of 500,000 deaths. His team then worked long days to produce the more complex simulations estimating how some policy actions might change the result. Cleaning up and releasing the code was not a top priority at the time, he says.

JAIME REINA/AFP/GETTY

Children account for fewer than 2% of confirmed COVID-19 infections in the United States.

WHY HEALTHY ARTERIES MIGHT HELP KIDS AVOID COVID COMPLICATIONS

Evidence suggests that resistance to blood clotting protects children from serious effects such as strokes.

By David Cyranoski

Since the coronavirus outbreak began, scientists have been trying to work out why children are much less likely than adults to experience severe complications from the infection. Now, research suggests that the answer might lie in children's healthy blood vessels.

Children make up only a small proportion of those infected by SARS-CoV-2, the virus that causes COVID-19. A large survey by the US Centers for Disease Control and Prevention in Atlanta, Georgia, found that children aged 17 and under, who make up 22% of the US population, account for fewer than 2% of confirmed COVID-19 infections across the United States. And, of 2,572 children included in the survey, only 5.7% went to hospital and only 3 died (see go.nature.com/2yocpzf).

Several theories have been proposed to explain why children aren't getting so ill. These include the possibility that they have a stronger and more effective initial immune response to the virus than adults do, and that they might have some immunity as a result