fault systems. In Italy's Appennine mountains, which run the length of the country, these quakes occur every few decades, most recently in 2016, 1997 and 1979. More than 300 people died between 24 August and 30 October 2016 as a result of the three earthquakes that hit central Italy, each larger than magnitude 6. The small, historic town of Amatrice was badly damaged by the first quake, and 299 people died.

"Essentially, we can consider sequence quakes as 'failed' big earthquakes," says Richard Walters, a geophysicist at Durham University, UK, who led the research. "The initial stress conditions are the same, but the cascading rupture of multiple segments takes place over days to weeks instead of over seconds."

MAX CAVALLARI/NURPHOTO/GETTY

The Italian town of Amatrice was largely demolished in three earthquakes in 2016.

COMPARE AND CONTRAST

To find out why, Walters and his colleagues took advantage of the wealth of satellite data from the Italian 2016 quakes. The satellites — part of Europe's Sentinel Earth-observing constellation — provided images of the shape of the ground surface. Because the data were taken roughly every 1.5 days, the scientists were able to compare images from before and after each quake and calculate how the ground had moved.

Combining these data with seismological and ground-based measurements, the team found that a network of smaller, cross-cutting faults underlies the Apennine region. The researchers say that these small faults act as barriers to the rupture process, preventing major faults from being 'unzipped' in one go. Had the faults all failed at once, the region would have experienced a single earthquake with a magnitude of about 6.7 — some 50% stronger than the largest individual quake that did strike.

Studying the thousands of small aftershocks that followed the first quake, the team observed tiny quakes creeping northwards at a rate of around 100 metres a day — and found that this matched the speed at which naturally occurring underground fluids would be expected to move along fault lines. "The pattern of small aftershocks suggests that each subsequent quake is triggered by the increased pressure associated with fluids being pumped through the network of minor faults," says Walters. The second quake, two months later, occurred exactly when the aftershocks — and fluid, as predicted by the team's models — reached the next major fault line. "The fluids are being driven by pressure changes. When they reach a fault, the increased pressure 'unclamps' the fault and allows it to move," says Walters.

Nicola D'Agostino, a geoscientist at the National Institute of Geophysics and Volcanology in Rome, finds the mechanism plausible. D'Agostino also agrees that it's theoretically possible to forecast the later quakes, but says it could be tricky to know when a quake is a one-off event and when it is the start of a sequence.

Stephen Hicks, an earthquake scientist at the University of Southampton, UK, thinks that the findings will change how geoscientists work. "Normally, we don't try and interpret aftershocks until later, but I think this will spur scientists into analysing more-subtle features in real time," he says. "The challenge will be to monitor and interpret the data quickly enough to provide a meaningful forecast." ■

PUBLISHING

China's academics await national journal blacklist

But some researchers say the policy won't succeed in improving research quality.

BY DAVID CYRANOSKI

A proposal by the Chinese government to create its own blacklist of journals is creating much debate among the country's scientists, who are still waiting for the list to be revealed, five months after the plan was announced.

Preparation of the list has been shrouded in secrecy. The government says it will include journals that it considers to be of poor quality or those seeking excessive profit, but it has not released its selection criteria, nor has it said when the policy will take effect.

A couple of commercial blacklists exist, and some Chinese institutions already have lists of journals that researchers should avoid, but lists run by government agencies are rare. The Chinese government hopes that a national policy will improve research integrity by reducing the number of low-quality or fraudulent articles from Chinese authors. Academics will receive warnings if they submit to the selected publications.

But some researchers say that a national blacklist won't fix these problems and will be difficult to manage. Lists of approved publications are a better tool for improving research quality, they say.

The science ministry was tasked with creating a blacklist in May, when the government announced a crackdown on scientific misconduct after numerous cases of fake peer reviews, plagiarism and the use of fraudulent data. At the time, the government said that the list would include domestic and international scientific journals, and that publications in these journals would no longer be counted towards a scientist's applications ▶

for promotion, jobs or grant funding.

Nature has seen several lists compiled by Chinese institutions that already tell researchers to avoid certain publications. The Zhongshan Ophthalmic Center at Sun Yat-sen University in Guangzhou circulated a document in January that warned its researchers against publishing in a list of journals that it labelled "controversial in the community" because they have had a lot of retractions. The Obstetrics and Gynecology Hospital of Fudan University in Shanghai has compiled another list. A representative of the hospital says that publications in the journals on its list are not forbidden, but that researchers cannot use grant money to pay the publication fees.

The first list contains two of the world's largest journals, *PLoS ONE* and *Scientific Reports*. Joerg Heber, editor-in-chief of *PLoS ONE*, says that he does not know why some Chinese universities discourage their researchers from submitting to the journal, because only a small fraction (119) of its almost 200,000 papers have been retracted.

A spokesperson from *Scientific Reports* said that they were unable to comment on individual decisions, but hoped that institutions will continue to recognize the journal's value. (*Nature*'s news team is editorially independent of its publisher, Springer Nature, which also publishes *Scientific Reports*.)

Omid Mahian, a thermal engineer at Xi'an Jiaotong University, thinks it would be better to have a national policy that applies to all researchers than for institutions to have their own lists.

And Shi Xiaolei, a science historian at the Institute for the History of Natural Science in Beijing, part of the Chinese Academy of Sciences (CAS), says that a national blacklist and those recently adopted at institutions "will have a positive impact on China's academic environment".

"The real problem is not with the journals, but with the person who submits the article."

Medical researcher Ren Chuanli says that a national blacklist might help to reduce scientific misconduct because it will punish some journals that publish low-quality manuscripts. "But the real problem is not with the journals, but with the person who submits the article," says Ren, who works at the North Jiangsu People's Hospital. He says that some high-quality journals publish low-quality papers, and that some journals that are considered low quality publish the occasional high-quality, highly cited article. Fraudulent papers, too, have appeared in journals of all qualities, so a blacklist based on overall journal quality won't necessarily stop those papers either, says neuroscientist Mu-ming Poo at the CAS Institute of Neuroscience in Shanghai.

Blacklists are also difficult to maintain because new journals are always launching, says Lars Bjørnshauge, the Cophenhagen-based managing director of the Directory of Open Access Journals. Bjørnshauge also wonders whether China might use blacklists as a way of promoting Chinese journals over others.

Yu Liping, who studies academic evaluation at Zhejiang Gongshang University in Hangzhou, doubts that the list will be comprehensive and include all the problematic Chinese journals that have been linked to scientific misconduct. Yu says lists of approved journals that meet certain standards are a better tool than blacklists for improving research standards.

Most researchers agree that what China needs is a more comprehensive system by which to evaluate research quality. "The important thing is whether those who evaluate research are actually evaluating the research and not only looking for papers in 'international' journals on the researchers' CV," says Bjørnshauge. ■

VIROLOGY

Hunting for HIV's hideouts

Scientists are testing new ways of mapping where the virus lurks in the body.

BY SARA REARDON

Antiretroviral drugs have transformed HIV infection from a death sentence to a chronic condition for many people who have the virus. But because HIV never truly leaves the body, the virus rebounds rapidly if patients stop taking the drugs.

Now, scientists are trying to work out how, and where, HIV hides when blood tests show that a person's viral load is low or undetectable. The location of this reservoir has long been a mystery, but that could soon change. Powerful new techniques are giving researchers an unprecedented look at how HIV travels though the bodies of people and other animals — turning up clues to the virus's hiding places and targets for future therapies.

HIV is a challenging foe because it integrates into the DNA of its host cells. Some scientists argue that a true cure would require the removal of all traces of the virus's DNA from the body, rather than simply preventing HIV from hijacking cells to replicate itself — and that goal might be unreachable. "We are starting to realize that getting rid of all the HIV DNA is not completely realistic," says Sara Gianella, an infectious-disease researcher at the University of California, San Diego.

The best that researchers can hope for may be to permanently silence or contain HIV after infection, says Gianella, who last week presented new findings on HIV's hideouts at a meeting organized by the US National Institutes of Health (NIH). Although antiretroviral drug cocktails — known as ART — can suppress HIV in immune cells in the blood, the first results from Gianella's "Last Gift" study confirm that the virus can stash itself in dozens of tissues.

The project examines bodies donated by people with HIV who enrol when they are within six months of death from unrelated conditions. All participants are on ART when they sign up for the study, but some are asked to stop taking the drugs. Gianella's team collects blood samples while donors are alive, and about 50 different types of tissue after death. The samples from people who stopped taking ART show where HIV has rebounded, whereas samples from people who continued on the drugs can provide clues about the virus's reservoir.

The researchers did not detect HIV in the blood of their first donor, who continued taking antiretroviral drugs until his death. But they did find viable virus in nearly all of the 26 tissues they examined after the man died.

Janice Clements, a pathobiologist at Johns Hopkins University in Baltimore, Maryland, calls the project "amazing". After a person with HIV dies, she says, researchers can rarely acquire tissue samples quickly enough to measure the level of virus present, and they usually don't know whether the dead person had been taking antiretroviral drugs.

Clements' research has shown that HIV tends to linger in the brain and cause neurological problems, because most antiretroviral drugs can't cross the blood–brain barrier. At the meeting, Clements and her colleagues presented the first evidence that simian immunodeficiency virus (SIV), which is closely related to HIV, survives in the spinal cord of macaques taking antiretroviral drugs and spreads quickly after the animals stop taking the drugs. "This is unlike any virus we've cured," she says.