with it in California next month.

"The whole-body machine is another quantum jump in medical imaging," says Abass Alavi, a radiologist at the University of Pennsylvania in Philadelphia. He is collaborating with Badawi to use the modified PET scanner to study atherosclerosis, a condition in which plaque builds up in a person's arteries. Eventually, Alavi says, physicians might be able to use the device to see whether certain drugs help to treat the artery-clogging disease.

Conventional PET scanners aren't usually used for this purpose because of the cost and the radiation exposure to the person, says Badawi.

Jain is hoping to use the device to test a radioactive sugar tracer he's developed that's ingested by bacterial but not mammalian cells. Injecting the tracer into people suspected of having a bacterial infection could highlight where in the body the bacteria are concentrated. Jain's lab is also developing tracers that could distinguish between types of bacterium. ■

AGRICULTURE

China seeks predator to stop voracious caterpillar

Scientists scramble to find ways to halt the fall armyworm's march across the country.

BY ANDREW SILVER

A hungry caterpillar that ravages crops is advancing across China and threatening the nation's vast supply of maize. Scientists are investigating ways to minimize the damage caused by the invasive fall armyworm — which was first detected in China in January — including experimenting with native predators that could keep the pest in check. Some researchers say that the insect's spread might have been slowed if the country grew genetically modified food crops.

The fall armyworm (*Spodoptera frugiperda*), a native of Central and South America, has spread around the world in the past few years, causing devastation of crops in parts of Africa and southern Asia. Since its arrival in China, it has been found in 18 provinces, regions and municipalities, according to China's ministry of agriculture.

So far, damage caused by the caterpillar — mostly to maize (corn), but also to other crops such as sugar cane — in China is considered manageable. But Hu Gao, an entomologist at Nanjing Agricultural University who is monitoring the insect's spread, says researchers and farmers fear what will happen when the pest arrives, probably later this month, at the North China Plain. China is the world's second-largest producer of maize, and the northern plain produces almost 30% of the country's crop.

WALDO SWIEGERS/BLOOMBERG/GETTY

The invasive fall armyworm has laid waste to crop plants around the world.

HIGH COST

Recent outbreaks of fall armyworm in Africa and southern Asia have resulted in maize yield losses as high as 50%. In Africa, where the pest arrived in 2016, it costs 12 major maize-growing countries a total of between US$1 billion and $4 billion in lost crops a year (X.-J. Li *et al.* Preprint at bioRxiv http://doi.org/c7dc; 2019). China is also still battling an epidemic of a highly contagious virus affecting pigs, African swine fever, which has led to the culling of more than one million of the animals.

"The spread of fall armyworm in China will have a significant impact, along with the spread of swine fever, on Chinese consumers," says Cong Cao, a researcher studying innovation at the University of Nottingham Ningbo China. The rising price of food will put tremendous pressure on the government to control the pest, says Cao.

Hu says that plant-protection centres in provinces and cities are focused on monitoring and controlling the fall armyworm's spread. The adult moths, which are responsible for the pest's spread, can travel hundreds of kilometres over successive nights. Control measures include traps and pesticides.

Scientists, meanwhile, are working on other strategies. Hu says researchers at his and other Chinese universities are studying chemicals that could be used to attract the insect to traps, and native insects that could be deployed as a means of biological control.

A report by the US Department of Agriculture, released in May, on the fall armyworm's spread in China said that the insect has no natural predators in the country, but Hu disputes that conclusion.

China's parasitic Braconid wasps already kill other species in the *Spodoptera* genus to which the fall armyworm belongs, including the cotton leafworm (*Spodoptera litura*) and the beet armyworm (*Spodoptera exigua*), so Hu thinks the wasp could also target the fall armyworm caterpillar. In Africa, some parasitoids

— whose young feed on and eventually kill their hosts — that target African cotton leafworm (*Spodoptera littoralis*) have already switched to feasting on the fall armyworm.

During recent field trials in Yunnan Province, where the pest was first identified, researchers based at the Institute of Plant Protection (IPP), part of the Chinese Academy of Agricultural Sciences in Beijing, have also found that the stink bug *Arma chinensis* kills the caterpillar.

PEST CONTROL

There could be many natural parasites or predators that target the pest, says Zhong Guohua, a researcher at the South China Agricultural University in Guangzhou who is working on controlling the fall armyworm, but whether they can ultimately be used for control it is difficult to predict. Finding out would require repeated testing to ensure that the predator is effective across large areas, and can be bred in large enough numbers, says Zhong.

"The spread of fall armyworm in China will have a significant impact on consumers."

In some countries, such as Brazil, the pest has been managed by growing transgenic food crops that contain genes from the bacterium *Bacillus thuringiensis* (Bt). The genes offer crops resistance to some pests, including the fall armyworm.

But Bt food crops have not been approved for commercial use in China, in part because of strong public opposition to genetically modified food, says Du Li, a specialist in biotechnology law at the University of Macau.

The growth of Bt maize across a large area of China would definitely have helped to control the pest, says Li Yunhe, a biotechnology researcher at the IPP.

But Hu says that it's not clear whether the crop can keep the pest at bay in the long term. In countries such as the United States, the insect has developed resistance to Bt crops, he notes.

Hu says that eradication in China is now unlikely, and that farmers will have to learn to manage the pest. Other major crop-producing countries are also in the insect's path — researchers predict that it will probably enter Japan and South Korea between now and next month. ■

RESEARCH MISCONDUCT

What universities can learn from epic case of research fraud

Analysis of misconduct investigations suggests institutional probes aren't rigorous enough.

BY HOLLY ELSE

By day, Andrew Grey studies bone health. But over the past few years, he's developed another speciality: the case of one of science's most prolific fraudsters.

From 1996 to 2013, Yoshihiro Sato, a Japanese bone-health researcher, plagiarized work, fabricated data and forged authorships — prompting the retraction of more than 60 studies from the scholarly literature so far. Grey and colleagues at the University of Auckland in New Zealand and the University of Aberdeen, UK, are among the researchers who have raised concerns about Sato's work over the past decade or so, and they have studied the case in detail — in particular, how universities involved in the research investigated concerns about his work and allegations of misconduct.

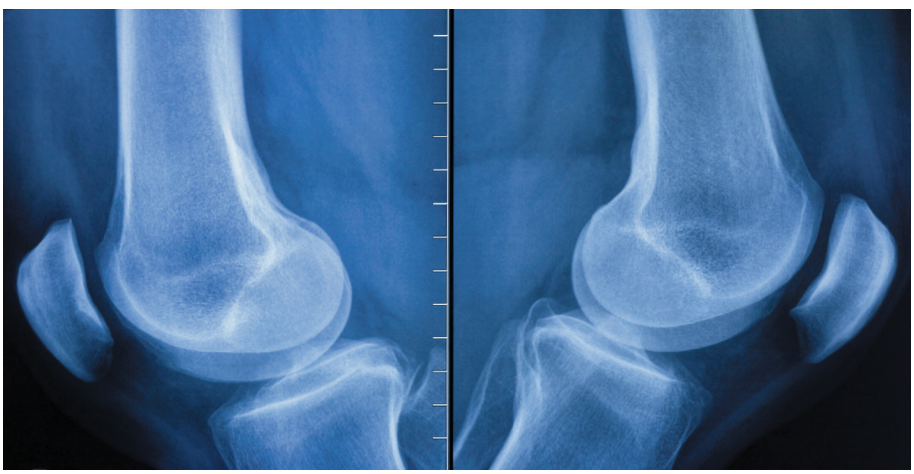
At the World Conference on Research Integrity in Hong Kong from 2 to 5 June, Grey's team described its years-long efforts to clean up Sato's literature, and presented its analysis of the inquiries conducted by four universities in Japan and the United States ensnared in the scandal. The team published its analysis of three investigations in February (A. Grey *et al. Res. Integr. Peer Rev.* **4**, 3; 2019). Grey says the findings support a growing view among some in the academic community: that university investigations into research misconduct are often inadequate, opaque and poorly conducted. The team says that the results challenge the idea that institutions can police themselves on research integrity, and proposes that there should be independent organizations to evaluate allegations of research fraud.

The analysis is one of just a few to look closely at research-misconduct investigations, and the first to use a systematic approach to rate them, says C. K. Gunsalus, a specialist in research integrity at the University of Illinois at Urbana–Champaign, who was not part of the analysis. Too many research-misconduct investigations turn out to be inadequate or flawed, says Gunsalus. She had a hand in creating a 26-point checklist that university officials can use to guide probes into research misconduct; Grey's team used this to rate the investigations.

The checklist questions an investigation's scope, reliability and impact — for instance, whether the investigating committee included external members and whether evidence could have been tampered with. Two members of Grey's team independently assessed each investigation report using the checklist. "Overall, each report was considered unacceptable by both assessors," say Grey and colleagues.

ALARM BELLS

Sato, who died in 2016, studied and ran clinical trials of drugs and supplements that might help to prevent bone fractures. Researchers in the field began raising concerns about his work ▶



AUSCAPE/UNIVERSAL IMAGES GROUP / GETTY

The field of bone health was hit by a sprawling case of research misconduct that affected tens of studies.