ON THE BLOCK
The US National Science Foundation is planning to divest itself of older telescopes to free up money for newer facilities.

Telescope	Location	Status
Arecibo Observatory (radio)	Puerto Rico	Environmental-impact study under way
Green Bank Observatory (radio)	West Virginia	Has left National Radio Astronomy Observatory; environmental impact study underway
Long Baseline Observatory (radio)	10 US locations	Has left National Radio Astronomy Observatory; part-time funding from US Navy
McMath–Pierce Solar Telescope (solar)	Arizona	Likely to close this year
Mayall 4-Meter Telescope (optical)	Arizona	To transition to Department of Energy for dark-energy studies
WIYN 3.5-metre observatory (optical)	Arizona	NSF to partner with NASA for exoplanet studies
Global Oscillation Network Group (solar)	Six locations worldwide	National Oceanic and Atmospheric Administration to share operating costs
Richard B. Dunn Solar Telescope (solar)	New Mexico	Likely to transition to consortium led by New Mexico State University
SOAR 4.1-metre telescope (optical and near-infrared)	Chile	To be reviewed

SOAR, Southern Astrophysical Research; WIYN, Wisconsin–Indiana–Yale–National Optical Astronomy Observatory.

SOURCE: NSF

facility, and even details which explosive would be needed to dismantle the 305-metre-wide dish.

NSF officials included this bleak option to satisfy federal rules that require them to describe the environmental impact of all possible outcomes. "We specifically leaned towards making things look a bit more drastic," says James Ulvestad, head of the NSF's astronomy division.

Gravitational-wave astronomers are among those who are unhappy about the idea of Arecibo going offline. The international NANOGrav consortium uses about 850 hours of Arecibo time each year to discern how ripples in space-time affect radio pulsars. Between Arecibo and Green Bank, the team is just now reaching the sensitivity at which it should be able to detect gravitational waves. "We're so close," says Xavier Siemens, an astrophysicist at the University of Wisconsin–Milwaukee. "Losing Arecibo would mean losing US leadership in the field."

Arecibo also has a unique role in stimulating public interest in science, says Edgard Rivera-Valentín, a planetary radar specialist at the observatory. Like many Puerto Ricans, he first visited Arecibo as a child, on a family trip. "It just blew me away," he says. "I knew pretty much then that I wanted to do astronomy."

The NSF pays for roughly two-thirds of Arecibo's $12-million annual budget. Half of that comes from its astronomy division and half from its atmospheric and geospace sciences division, which uses Arecibo to study Earth's ionosphere. The remainder comes from NASA, which tracks near-Earth asteroids from Arecibo and would probably keep doing so if other collaborators stepped in to make up for NSF cutbacks.

Arecibo's current operating contract ends in March 2018. After that, new approaches to make ends meet could include charging scientists hourly rates to use the observatory, instead of having them apply for time through federal agencies. "This is where the rubber hits the road," says White. ■

DRUG DISCOVERY

Chemists warn against deceptive molecules

Spice extract curcumin dupes assays and leads some drug hunters astray.

BY MONYA BAKER

Inside the golden-yellow spice turmeric lurks a chemical deceiver: curcumin, a molecule that is widely touted as having medicinal activity, but which also gives false signals in drug screening tests. For years, chemists have urged caution about curcumin and other compounds that can mislead naive drug hunters.

Now, in an attempt to stem a continuing flow of muddled research, scientists have published the most comprehensive critical review yet of curcumin — concluding that there's no evidence it has any specific therapeutic benefits, despite thousands of research papers and more than 120 clinical trials. The scientists hope that their report will prevent further wasted research and alert the unwary to the possibility that chemicals may often show up as 'hits' in drug screens, but be unlikely to yield a drug.

KAI WONG/ISTOCK/GETTY

Turmeric — a source of wasted effort and funding.

"Curcumin is a cautionary tale," says Michael Walters, a medicinal chemist at the University of Minnesota in Minneapolis, and lead author of the review (K. M. Nelson *et al. J. Med. Chem.* http://dx.doi.org/10.1021/acs.jmedchem.6b00975; 2017), published on 11 January. Commonly used drug screens detect whether a chemical latches on to a binding site of a protein implicated in disease — a hint that it may be the starting point for a drug. But some molecules, such as curcumin, seem to show such specific activity when there is none. The molecules may fluoresce naturally, foiling attempts to use fluorescence as a signal of protein binding. They may disrupt cell membranes, duping assays that try to spot drugs targeting specific cell-membrane proteins. And

they may surreptitiously degrade into other compounds that have different properties, or contain impurities that have their own biological activity.

Chemists call these irritants PAINS (pan-assay interference compounds) — and curcumin is one of the worst. "Curcumin is a poster child for these promiscuous molecules that come up often in screens," says James Inglese, who directs assay development and screening technology at the National Center for Advancing Translational Sciences in Bethesda, Maryland. "A lot of people doing this kind of work aren't technically aware of all the issues that this thing can cause."

"Much effort and funding has been wasted on curcumin research," says Gunda Georg, co-editor-in-chief of the *Journal of Medicinal Chemistry*, which published the review. Even so, she says, her journal sees a regular stream of curcumin manuscripts. Curcumin has been proposed to treat such disorders as erectile dysfunction, hirsutism, baldness, cancer and Alzheimer's disease, says Guido Pauli, a natural-product researcher at the University of Illinois at Chicago and a co-author of the review. But it's never yielded a proven treatment.

Pauli thinks part of the problem is that researchers don't always know what molecule they are studying. Turmeric extracts contain dozens of compounds besides curcumin, which is itself used as a shorthand for three closely related molecules. In some cases, researchers may observe promising biological effects but ascribe activity to the wrong molecule.

Misinterpretations feed on themselves, Walters says. Curcumin gets reported as having an effect even if the assay was flawed. "People accept what is in the literature as being correct and then build a hypothesis, even though it doesn't hold up." And scientists don't seem to check the literature to see whether compounds have been flagged as problematic. At least 15 articles on curcumin have been retracted since 2009 and dozens more corrected.

Many researchers are still optimistic about curcumin. "There is evidence that the biological activity of curcumoids is real," says Julie Ryan, a radiation oncologist at the University of Rochester Medical Center in New York. She says that it interacts with many different proteins and so works differently from many drugs. Ryan has tested curcumin in clinical trials for dermatitis on more than 600 people. Although she found no significant effect, she says there were trends that warrant further study. She thinks that chemically modified forms of curcumin might prove more effective at reaching tissues.

But the review shows that getting real answers will be tough, says Bill Zuercher, a chemical biologist at the University of North Carolina at Chapel Hill. "It may very well be the case that curcumin or turmeric extracts do have beneficial effects, but getting to the bottom of that is complex and might be impossible," he says. ■

MIKE SYMES/DEVON WILDLIFE TRUST

Beaver reintroduction is an example of a programme that could blossom after Brexit.

ENVIRONMENT

Brexit is chance for greener nation

UK environmental scientists plan to push for policy changes but are nervous about losing current protections.

BY DANIEL CRESSEY

Britain's environment faces significant risks from Brexit, with protections for wildlife and millions of euros in funding for environmental programmes now facing an uncertain future. But the pending departure of the United Kingdom from the European Union will free lawmakers to craft UK-specific legislation — and some environmental researchers spot a rare chance to use their expertise to shape future policy.

"The decision to leave the European Union presents substantial risks, but also significant opportunities," says Sue Hartley, an ecologist at the University of York, UK, and president of the British Ecological Society. She gave evidence to a parliamentary inquiry into the impact of Brexit on the environment, which was led by Member of Parliament Mary Creagh and released its conclusions on 4 January.

The process of leaving the EU is due to start by the end of March 2017, and must be completed within two years. To avoid a sudden change in how things work, the UK government says it will introduce a 'great repeal bill' that will largely convert EU laws into UK ones. But it will then be able to modify or strike out EU laws, something that currently requires unwieldy negotiations with the rest of the EU.

Some environmental campaigners are worried about what this will mean for the EU legislation that currently safeguards UK birds and habitats. "The evidence has shown that these directives are effective," says Martin Harper, conservation director of the Royal Society for the Protection of Birds. Creagh's committee has called for an act to safeguard existing protections for UK wildlife ahead of the implementation of the great repeal bill.

But environmental researchers, many of whom have spent years pushing for reforms to huge EU programmes only to be frustrated by the slow pace of change, also spy an opportunity — in particular when it comes to one of the most contentious pieces of EU legislation, the Common Agricultural Policy, or CAP.

In the United Kingdom, most CAP funding is spent on direct payments to farmers to support their income. This amounts to around £1.8 billion (US$2.2 billion) annually. A smaller proportion — £400 million — goes to programmes that benefit the environment, such as paying for buffer strips between fields to promote wildlife habitat or to reduce damage from fertilizers. ▶