

its suppliers to work out which areas will be affected by a no-deal split.

To prevent disruption to experiments, University College London (UCL) is preparing for a period without imports of animals and animal products. The university is planning to stockpile mouse bedding, says Robertus De Bruin, a molecular biologist at the university.

The Medical Research Council Laboratory for Molecular Cell Biology, based at UCL, is stocking up on fly food as well as Danish-made Petri dishes and tissue-culture plates, says De Bruin. The Francis Crick Institute in London is ensuring that it has at least a month's worth of stock for everyday consumables, such as gloves, goggles and lab coats, he added.

The UK health department has pledged to charter a plane to fly in radioisotopes essential for medical screening for conditions such as liver disease and cancer. These currently come from the Netherlands through the Channel Tunnel and are too short-lived to be stockpiled.

IMMIGRATION, TRAVEL AND RECRUITMENT

How immigration systems will handle a no-deal Brexit remains unclear and a key concern. EU citizens enjoy rights to live and work anywhere in the bloc, but this 'freedom of movement' between Britain and the continent would end immediately on Brexit day.

The government's — and universities' — priority has been to ensure that EU citizens already in the United Kingdom can remain there (and vice versa). EU citizens already in the United Kingdom by 29 March can apply to 'settle' in Britain (many EU countries plan similar measures for UK citizens). UK universities have been holding clinics to share information on travel and immigration issues with EU workers.

The European Commission has confirmed that UK citizens would not need a visa for visits of up to 90 days — even in the event of no deal — as long as the same applies for all EU citizens entering the United Kingdom, which means travel for conferences and collaborations should be largely unhindered.

DATA SHARING AND CLINICAL TRIALS

EU states are governed by common legislation, so Brexit will introduce legal hurdles for researchers in UK–EU collaborations around data sharing and clinical trials. UK data regulations should, technically, still align with those of the EU after departure. But the ability to transfer data from the EU to the United Kingdom after Brexit relies on the commission first formally deciding that the new non-member-state's data-protection laws are adequate — something it will do only after Brexit day. In the meantime, universities might need to work commission-approved language into every individual contract that involves data transfer within the EU.

UK-led clinical trials that involve patients in EU countries would need either to transfer responsibility for the trial to a collaborator in an EU nation or to establish a legal presence in the bloc. ■

ASTRONOMY

US space scientists plot wish list

Decadal survey is haunted by ghosts of past rankings.

BY ALEXANDRA WITZE

Dream big, but be realistic. That's the message for US astronomers as they begin debating what their field should do for the next ten years.

The US National Academies of Sciences, Engineering, and Medicine have just launched astronomy's 'decadal survey', the highly influential process of prioritizing which telescopes and space missions Congress and government science agencies should support.

Past decadal surveys have cleared the way for groundbreaking missions such as NASA's Chandra X-Ray Observatory. But they have also ensnared the space agency in financial problems and delays. Neither of the large space missions recommended by the 2001 and 2010 decadal surveys — the James Webb Space Telescope and the Wide Field Infrared Survey Telescope (WFIRST), respectively — has yet launched.

The 2020 decadal survey will develop detailed cost estimates for each project, as well as guidance for what managers can do if money gets tight. "We have to look at the budget reality while also doing things that are visionary," says Fiona Harrison, an astronomer at the California Institute of Technology in Pasadena and co-chair of the effort.

Responding to problems of racism and harassment in science, the survey will also assess the state of astronomy as a profession and make recommendations for how it can improve. "We're going to go there," says the other co-chair, Robert Kennicutt, an astronomer at the University of Arizona in Tucson and Texas A&M University in College Station.

He and Harrison described their plans for the decadal survey on 9 January at a meeting of the American Astronomical Society in Seattle, Washington.

Anyone interested in being on one of the project's many panels could apply until 22 January. White papers describing visionary science are due on 19 February, but this deadline could be extended given the ongoing partial US government shutdown.

Past decadal surveys have been very popular with key members of Congress, who see them as a unified wish list from astronomers, ranking projects of all sizes. "This community is very good about getting in a small room, getting out the knives and stabbing each other in the back," says Jeremy Weirich, vice-president

for corporate strategy at the Association of Universities for Research in Astronomy in Washington DC, who formerly worked on the Senate's spending committee. "But when the doors open and you come out, you are good at speaking with a common voice."

Programme managers at NASA, the National Science Foundation (NSF) and the Department of Energy rely on the decadal survey when deciding what to fund. But projects can unexpectedly consume years of budgets and planning. The 2001 survey estimated that the Webb telescope would cost US\$1 billion. Now, it is slated to launch in 2021 at a cost of \$8.8 billion. Meanwhile, the top space mission from the 2010 survey — WFIRST — is looking at a launch in the mid-2020s at the earliest.

BIG AMBITIONS

Hoping to stave off problems this time around, NASA has already asked astronomers to draw up detailed plans on four possible big space missions. They include a 'Hubble-on-steroids' space telescope that would span wavelengths from ultraviolet to infrared with a massive 15-metre mirror; an innovative X-ray observatory; a technologically advanced infrared telescope; and a 4-metre telescope with a starshade to study exoplanets.

"We have to look at the budget reality while also doing things that are visionary." Their prices are not yet set, although NASA has required

each of the four to produce design options that would cost between \$3 billion and \$5 billion. Each is much more developed, at least on paper, than Webb and WFIRST were at this point in previous survey cycles.

The latest decadal survey will also tackle the future of big observatories on Earth. That means assessing the forced marriage of two formerly competing projects that had been working with private funding but now need NSF cash to finish the job: the Giant Magellan Telescope, already under construction in Chile, and the Thirty Meter Telescope, which is likely to resume attempts at construction on Mauna Kea, Hawaii, this year.

The survey will also consider how all recommended US projects, from large to small, fit with international collaborations such as Europe's own road map for astronomy. The US survey is slated to come out in the second half of 2020. ■