55; 2017). Buzz around these results has piqued theorists' interest in Belle II, and has prompted new groups to join the international collaboration, says Tom Browder, a physicist at the University of Hawaii at Manoa and spokesperson for the Japan-based experiment.

CLEANER PHYSICS

The collisions at the Belle II experiment will be cleaner and more precise than those at the LHC experiment, called LHCb. That is because the LHCb experiment smashes together protons, which are each composed of three quarks and so make for messy collisions. But Belle II will crash electrons and positrons into each other, both of which are fundamental and so cannot break down any further.

Belle II will be able to study decays involving elusive neutrinos and photons that are harder to investigate with LHCb. This could help it to spot evidence for hypothetical particles, such as charged versions of the Higgs boson — a particle discovered at the LHC in 2012 — and particles such as the axion, a form of dark matter thought to interact with matter only very weakly, says Browder. "There's definitely competition between the two, but also complementarity."

The collider feeding the Belle II experiment will squeeze particles into a tight beam just 50 nanometres across, an advance that will lead to a collision rate 40 times that achieved by its KEK predecessor. This will help it to explore reams of recently discovered exotic particles made up of four or five quarks — tetraquarks and pentaquarks, respectively — and allow it to scour rare b-quark decays for any as-yet unknown preference towards the production of matter over antimatter. It will enable physicists to explore intriguing signs of physics beyond the standard model, a theory that has been verified repeatedly by experiments since the 1970s, but which fails to account for gravity or a host of other mysteries.

Collider experiments produce sprays of many particles that can live for tiny fractions of a second before decaying into other particles. In a handful of decays — involving the transformation of certain B-mesons into electrons and their heavier cousins, called muons and taus — LHCb has seen particles produced at unexpected rates.

It will enable physicists to explore intriguing signs of physics beyond the standard model.

Although each individual finding could easily be a statistical fluctuation, together they have gained attention, says Giovanni Passaleva, a physicist at the National Institute for Nuclear Physics in Florence, Italy, and spokesperson for the LHCb experiment. They broadly point in the same direction and build on similar findings from two previous experiments: the BaBar Collaboration at the SLAC National Accelerator Laboratory in Menlo Park, California; and Belle II's predecessor at KEK, he says. "So it looks like there is some correlation in these deviations, which make them more interesting than others."

SCHEDULED CATCH-UP

However, Belle II will need to catch up with LHCb, whose accelerator produces more B-mesons and has been running since 2009. Once the full physics programme gets under way at the start of 2019, Belle II will take around a year to gather enough data to compete with LHCb. Meanwhile, LHCb will collect data from May until it shuts down for upgrades in November. By then, it should have seen enough decays to either dispel the potential signal or push it into discovery territory. "Our hope is that we get the machine and the detector working fast enough so we can start to catch up with them," says Browder.

The race to claim discovery will come down to which decays prove the most revealing, says Browder. But even if LHCb gets there first, confirmation of new physics from Belle II will be "absolutely essential", says Passaleva. Differences between the two experiments mean that Belle II could help physicists to work out what is behind any new interaction, and definitively rule out experimental error. "Then we'd be sure it's really new physics," he says, "because it will be seen by a completely different experiment in a completely different environment."■

IMMIGRATION

Uncertainty grows for US 'Dreamer' scientists

Court temporarily revives protections against deportation as Congress mulls policy reform.

BY CHRIS WOOLSTON

Like other young researchers in graduate school, Evelyn Valdez-Ward has a lot on her plate. An ecology student at the University of California, Irvine, she has been running field experiments and scrounging for research funding. But, above all, she is worried about whether she can stay in the United States. "My first year has been a real whirlwind," she says. "On top of how difficult grad school is, Trump got elected."

Her future depends on a US government programme that the president, Donald Trump, has attempted to shut down. Known as Deferred Action for Childhood Arrivals (DACA), it shields nearly 800,000 people from deportation, all of whom were brought to the United States illegally as children. Last September, Trump moved to end the programme, prompting a flurry of lawsuits. On 9 January, a federal judge in San Francisco, California, ordered the government to continue DACA while one of the court cases proceeds.

That is little comfort to Valdez-Ward. "If DACA expires, there's no way I can finish my PhD. I would lose everything."

Former president Barack Obama established the DACA programme in 2012 to give young, undocumented immigrants access to legal employment and more forms of financial aid for university studies. To enrol, immigrants must prove that they came to the United States before their sixteenth birthday and have a high-school diploma or are studying for one, among other requirements. Those who are granted DACA status — known as Dreamers —must apply to renew it every two years. Without such protections, they risk being sent back to countries they might not remember, and whose language they might not speak.

Trump's move last year to end DACA prompted lawsuits from 19 states and Washington DC, among other challengers. The case that ultimately led federal judge William Alsup to order DACA's reinstatement was filed by the University of California system — which estimates that some 4,000 of its students are in the country illegally, and that many are probably eligible for DACA status.

"DACA empowered people to start making

DREW ANGERER/GETTY

Many people are pushing for legislation that would give US 'Dreamers' a path to citizenship.

investments in their future, to go to college and medical school," says Roberto Gonzales at Harvard University in Cambridge, Massachusetts, who studies how immigration policies affect the lives of undocumented US immigrants. "Now, that's been thrown into peril."

DACA helped engineering student Josue De Luna Navarro to attend the University of New Mexico in Albuquerque. But he fears that the programme could end. "I remember sitting in a chemical-engineering class trying to calculate a molecule moving through a membrane," he says. "How can I focus on something like that when there's a huge terror in my family and my community about deportation?"

Trump and the US Congress are attempting to negotiate legislation to overhaul US immigration policies — which could end DACA, or shore up the programme. On 11 January, a group of six Democratic and Republican senators announced a compromise that would give DACA recipients a path to citizenship while bolstering border security, but Trump rejected the plan. He has argued that Obama lacked the authority to establish the DACA programme.

Ongoing court cases might determine DACA's short-term future, but its ultimate fate lies with Congress, says Michael Olivas, director of the Institute for Higher Education Law and Governance at the University of Houston in Texas. "This is not a legal issue," he says. "Comprehensive immigration reform, or at least a DACA bill without a bunch of other things attached to it, is the answer." ■

GENETICS

Synthetic species can elude gene mixing

Engineered organisms cannot breed with wild cousins.

BY EWEN CALLAWAY

Maciej Maselko has made wild sex deadly — for genetically modified organisms. The synthetic biologist at the University of Minnesota, Twin Cities, in St Paul and his colleagues have used gene-editing tools to create genetically modified yeasts that cannot breed successfully with their wild counterparts. In so doing, they say they have engineered synthetic species.

"We want something that's going to be identical to the original in every way, except it's just genetically incompatible," says Maselko, who presented his work on 16 January at the annual Plant and Animal Genome Conference in San Diego, California. The research was co-led by Michael Smanski, a biochemist at the University of Minnesota.

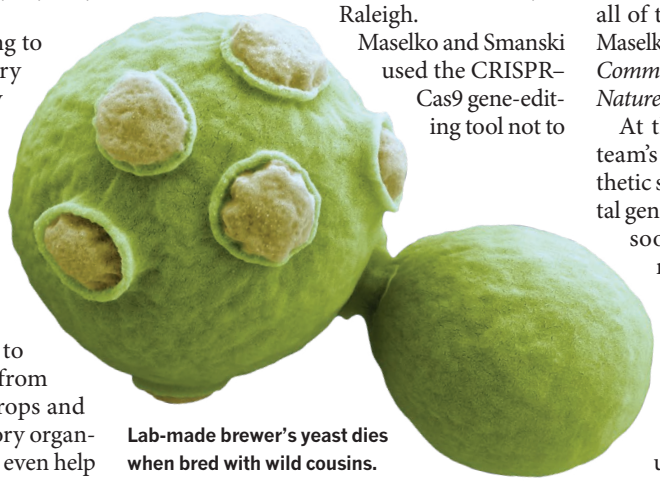
The technology could be used to keep genetically modified plants from spreading genes to unmodified crops and weeds, thereby containing laboratory organisms, the researchers hope. It might even help combat pests and invasive species, by replacing wild organisms with modified counterparts. Other scientists say that the approach is promising, but warn that it could be stymied by technical hurdles, such as the ability of modified organisms to survive and compete in the wild. "This is an ingenious system and, if successful, could have many applications," says evolutionary biologist Fred Gould of the North Carolina State University in Raleigh.

Maselko and Smanski used the CRISPR–Cas9 gene-editing tool not to edit target genes, but to alter their expression. The team guided the Cas9 enzyme to over-activate genes so that their protein products accrued to toxic levels. When they first tested the approach in brewer's yeast (*Saccharomyces cerevisiae*), they raised the levels of a protein called actin to the extent that the cells containing it exploded.

To prevent genetically modified yeast cells from mating successfully with other strains, the team engineered two modifications to the yeast cells. One change was analogous to a 'poison': it produced a version of Cas9 that worked with other factors to recognize and over-activate the actin gene. The second modification, the 'antidote', was a mutation that stopped Cas9 from overexpressing actin.

A yeast strain that contained both poison and antidote produced healthy offspring when mated with a strain carrying the antidote. But when the modified strain was crossed with a different lab strain lacking the antidote, almost all of their offspring popped like balloons, Maselko and Smanski's team reported in *Nature Communications* in October (M. Maselko *et al. Nature Commun.* **8,** 883; 2017).

At the meeting, Maselko discussed the team's progress towards engineering a synthetic species of fruit fly, using a developmental gene called wingless as a poison. Work will soon commence in plants, mosquitoes, nematodes and zebrafish, says Maselko, who, with Smanski, has applied to patent the approach.



EYE OF SCIENCE/SPL

Lab-made brewer's yeast dies when bred with wild cousins.

A COUNTER TO INVASION

A synthetic species could also be used to outcompete and control undesirable species that spread ▶