NEWS IN FOCUS

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Astronomical research is on pause at the Large Millimeter Telescope in Mexico owing to gang violence.

COMMUNITY

Violent drug cartels stifle Mexican science

Increasing dangers are forcing researchers to abandon projects or delay their work.

BY EMILIANO RODRÍGUEZ MEGA

For astronomers at the Large Millimeter Telescope in Mexico's Puebla state, the new year began with disturbing news. Their work probing the formation and evolution of stars, planets, black holes and galaxies had been put on hold until further notice, after a spike in drug-cartel activity around Sierra Negra — the extinct volcano that hosts the telescope. The final straw came in December, when one of the facility's employees was carjacked. Officials at the observatory — which is funded by the Mexican government and the University of Massachusetts Amherst — decided that it was no longer safe for people to go to work.

Across Mexico, drug-related violence has been on the rise for more than 12 years. The country documented 33,341 homicides last year — a record, the government said last month. Much of the surge was driven by a rise in increasingly violent drug gangs. Clashes between cartels and government security forces have driven scientists to abandon field sites, interrupt experiments or even change research interests.

Nobody has systematically documented the effects of organized crime on the Mexican research community, says David Ledesma, a spokesperson for the country's science-funding agency, the National Council for Science and Technology. But individual stories make clear that it has hampered scientific research.

Scientists are witnessing the collateral effects of something that has deeply transformed the rest of the country, says ▶

Arnulfo Blanco García, a restoration ecologist at the Michoacan University of San Nicolás de Hidalgo in Morelia. "I've seen it impact my youth, the economy, people's quality of life," he says. "This is never going to end."

The black market for petrol is driving violence near the Large Millimeter Telescope (LMT), says David Hughes, an astronomer at the National Institute of Astrophysics, Optics and Electronics (INAOE) and director of the telescope. Fuel pipelines pass very close to Sierra Negra, and the area has become more dangerous as Mexico's drug cartels have moved in to tap the pipelines and sell the stolen petrol.

But the damage caused by drug-related violence cuts across scientific fields. On 28 January, Blanco García got a phone call from one of his collaborators in Tierra Caliente, an area disputed by feuding drug cartels. Community members who worked with Blanco García had received death threats from local gangs who wanted them to stop monitoring populations of military macaws (*Ara militaris*), a vulnerable species of parrot. The cartels felt the research had focused too many curious eyes on the area.

"I cried out of frustration," Blanco García says. He was supposed to visit his colleagues in late January, but now he's not sure when he'll return.

International collaborations have also suffered. Three years ago, Bryan Fry, a venom researcher at the University of Queensland in St Lucia, Australia, and his Mexican colleagues had to stop visiting a cave at their field site near Cuernavaca, where they were studying vampire bats (*Desmondus rotundus*). A drug-trafficking route runs through the area, and fighting between cartels and the military made fieldwork extremely dangerous, especially at night.

The team was studying a peptide in the bats' venom that could have medical applications, such as helping to heal reattached body parts or transplanted tissue. The researchers wanted to search for variations of the peptide that could act more quickly and last longer, but that meant they needed to study more bats.

Fry and his colleagues can't return to the cave near Cuernavaca, so he is considering shifting his fieldwork to Costa Rica. But getting the permits to start searching for the right cave can take up to two years. "It's an inconvenience for me," Fry says. "But for Mexican researchers it's absolutely heartbreaking; their country is being denied to them."

Mariela Fuentes Ponce, an agronomist at the Metropolitan Autonomous University in Mexico City, had spent four years helping Indigenous communities in the southwestern state of Guerrero to improve their farming practices. But after soldiers detained one of her colleagues and falsely accused him of being involved with drug traffickers, or narcos, in 2016, Fuentes Ponce abandoned the project out of safety concerns. She lost all of her data and never saw the results of her work.

HOPING FOR CHANGE

Still, some scientists have tried to work around the violence. Many do what Luis David Alcaraz, a microbial-genomics researcher at the National Autonomous University of Mexico in Mexico City calls "road biology", in which researchers take samples along the main highways to avoid risky encounters in more isolated areas. "The narcos stripped us of our exploratory vein," Alcaraz says.

Landscape ecologist Camilo Alcántara, of the University of Guanajuato, says his team is relying less on field measurements and more on satellite images to study land-use changes. But remote measurements can take them only so far. At some point, Alcántara says, "your models end up being pure speculation".

Mexico's government is also trying different strategies to address the drug-related violence. President Andrés Manuel López Obrador announced on 30 January that Mexico's war on drugs had ended and that, in a bid for peace, his administration would no longer prioritize capturing cartel leaders. But researchers are sceptical that this will work.

"We're waiting for the authorities to help us do our jobs," says Alberto Carramiñana, an INAOE astrophysicist who works at the High-Altitude Water Cherenkov Observatory (HAWC), which detects high-energy cosmic and γ-rays in a search for supernovae and neutron-star collisions. The observatory and the LMT are neighbours, and HAWC researchers were barred from visiting the telescope on 9 January over safety concerns.

On 7 February, government officials said they expected that the LMT and HAWC would return to normal operations in a couple of weeks with help from state authorities. But for security reasons, they declined to give details during a press conference on how this would be accomplished.

"Ultimately, what we want to do is go back and better understand the Universe," says Carramiñana. ■

OCEANOGRAPHY

Antarctic voyage to explore ocean long hidden by ice

German research team hopes to observe underwater ecosystem changing in real time.

BY QUIRIN SCHIERMEIER

Scientists are setting out to explore a marine realm that was hidden from the Sun for more than 100,000 years.

In July 2017, a giant iceberg broke off from the Larsen C ice shelf east of the Antarctic Peninsula, revealing a large swathe of ocean that had lain in darkness beneath the ice.

The newly exposed sea bed might hold clues to the evolution and mobility of marine life and its response to climate change.

A team led by Boris Dorschel, chief scientist of a 45-strong international team on board the German research icebreaker *Polarstern*, set off from Chile this week to explore for the first time the sea that the ice had concealed. The ship left port on Monday from Puntas Arenae, where it had been loaded for the nine-week expedition.

But the remote area is hard to reach, and severe weather could make it challenging to conduct research there.

"It's thrilling to explore one of the last white spots on Earth," says Dorschel, who is based at the Alfred Wegener Institute for Polar and Marine Research in Bremerhaven, Germany. "But it's a nerve-racking affair, too. Local weather and ice conditions might interfere any time."

The 5,800-square-kilometre chunk of ice that calved from Larsen C in 2017 has since drifted some 200 kilometres northwards.

WHAT LIES BENEATH

Scientists are keen to explore what species might have thrived under the ice, and how the ecosystem has coped with the sudden change. The first attempt to do so failed last year, when sea ice up to 5 metres thick forced the *James Clark Ross* vessel, operated by the British Antarctic Survey (BAS), to turn back