

News in focus



Fire tore through several rooms used to store plant, animal and human specimens at the Federal University of Minas Gerais in Brazil.

SECOND BRAZILIAN MUSEUM FIRE IN TWO YEARS REIGNITES CALLS FOR REFORM

Blaze at a natural history museum in Minas Gerais is forcing some researchers to relive the pain of losing priceless specimens and artefacts.

By Emiliano Rodríguez Mega

Researchers in Brazil are sifting through the ashes of a fire that destroyed part of a museum in the southeastern state of Minas Gerais on 15 June. The blaze follows repeated warnings about fire risks at museums, and comes less than two years after a massive inferno gutted the prized National Museum in Rio de Janeiro.

The latest fire has reopened wounds in the research community and intensified a national conversation about the need to protect Brazil's

cultural and scientific heritage.

Mariana Lacerda, a geographer at the Federal University of Minas Gerais (UFMG) in Belo Horizonte, received a disturbing Monday-morning call: a building at the university's Natural History Museum and Botanical Garden, which she'd directed for almost a year, was in flames. When she arrived on the scene, smoke was still coming out of a single-storey building that housed thousands of artefacts, skeletal remains and taxidermied animals, many collected several decades ago.

Two storage rooms full of fossils and large

archaeological objects were covered in soot and smoke. Flames had partly consumed a third room, which housed folk art, Indigenous artefacts and biological specimens. Two further rooms, housing important collections of insects, shells, birds, mammals, human bones and ancient plant remains, were almost completely lost.

For these, "little hope remains of material that can be recovered", Lacerda says. "Something that is so slow to build was destroyed so quickly, in just over an hour."

Archaeologist André Prous, who started

HISTORY IN FLAMES

Since 2010, at least six sites relevant to Brazil's scientific history have caught fire. There has also been damage to other cultural sites.

- 2010 ● **Butantan Institute, São Paulo** — An inferno destroyed almost 90% of the museum's snake bank, the largest in Latin America, and a small part of its arachnid collection. Buntantan has been able to replace only about one-third of its snake specimens.
- 2012 ● **Comandante Ferraz Antarctic Station** — A fire that started in the machine room housing the power generators destroyed approximately 70% of the research station. Two people died.
- 2013 ● **Museum of Natural Sciences, Belo Horizonte** — The museum, owned by the Pontifical Catholic University of Minas Gerais, went up in flames in January.
- 2015 ● **Museum of the Portuguese Language, São Paulo** — In December, a major fire destroyed the museum building and killed one firefighter. The museum has since been rebuilt and was scheduled to open its doors in June 2020.
- 2018 ● **National Museum, Rio de Janeiro** — In September, a blaze at the National Museum claimed many of the most prized records of the nation's past. Recovery and reconstruction efforts continue.
- 2020 ● **Natural History Museum and Botanical Garden, Belo Horizonte** — A fire destroyed parts of the museum owned by the Federal University of Minas Gerais, affecting stored zoological and archaeological specimens. As yet, authorities have no estimate of the scope of the loss.

working at the museum in 1975, was devastated. He and his colleagues had amassed a collection of human remains from a range of periods, including some from the earliest known inhabitants of Brazil, as well as samples of cultivated and wild plant species. Prous had also seen part of his life's work disappear during the 2018 fire at the National Museum, when ancient skulls that he helped to collect in the 1970s were destroyed.

"The sadness is matched only by the fear that other, similar disasters will continue to destroy [Brazil's] scientific heritage," he says. Some stone artefacts, ceramics and documentation of the sites he has excavated survived the blaze.

Historic losses

Brazilian museums have faced a series of fires, often resulting in irreparable losses, says Carolina Vilas Boas, director of museum processes at the Brazilian Institute of Museums in Brasilia. At least 12 buildings of cultural or scientific significance have burnt in the country, many of them in the past 10 years (see 'History in flames'). But the full extent of the damage is hard to know, says Vilas Boas, because reporting is probably incomplete.

Brazil is not unique in losing heritage institutions to fire, she says, but the country does have a poor record in taking care of its museums. Often, fire-prevention systems are

installed, but budgets are too thin to maintain them properly. "There are many actions being taken to mitigate this risk," she says, but recurring economic crises have hindered long-term planning.

"That lack of resources had no relation to the fire in the collection's storage rooms," says Ricardo Hallal Fakury, a structural engineer at the UFMG. He did not speculate as to the cause of the fire, because investigations are still under way. But he says that the building that burnt was equipped with smoke detectors, and was mostly built of non-flammable materials.

Federal pressure

The tragedy in Belo Horizonte has amplified a decades-long discussion among Brazilian scientists pushing for national and state-level policies to help protect research collections, says Luciane Marinoni, an entomologist at the Federal University of Paraná and president of the Brazilian Society of Zoology, both in Curitiba. "The community is upset because we have been trying to solve this problem with the federal government but without success."

Some protective policies already exist. In

2017, the southern state of Paraná established norms and guidelines for the recognition of biological collections, defining who has responsibility for them, and putting in place objectives and goals to expand them and provide maintenance. Last year, the policy helped researchers to convince the government of Paraná to allocate 2 million reais (US\$370,000) for the state's collections over the next three years. It's not a lot of money, but it's a solid start, says Marinoni. "The collections are leaving the darkness."

Back in Belo Horizonte, scientists are cleaning up after the fire. This time, however, they have some guidance on how to move forward.

National Museum researchers have teamed up with Lacerda to advise on the recovery of items that might still be salvageable. They are sharing protocols they developed after the 2018 blaze with UFMG professors and students who have volunteered to help. "Unfortunately, we are now experts in this matter," says palaeontologist Alexander Kellner, director of the National Museum. "We went through it. We know the mistakes to avoid, we have a way to act, we have a methodology."

PHYSICISTS FIND BEST EVIDENCE YET FOR ELUSIVE 2D STRUCTURES

Strange quasiparticles called anyons could herald a way to build quantum computers.

By Davide Castelvecchi

Physicists have reported what could be the first incontrovertible evidence for the existence of unusual particle-like objects called anyons, which were first proposed more than 40 years ago. Anyons are the latest addition to a growing family of phenomena called quasiparticles, which are not elementary particles, but are instead collective excitations of many electrons in solid devices. Their discovery — made using a 2D electronic device — could represent the first steps towards making anyons the basis of future quantum computers.

"This does look like a very big deal," says Steven Simon, a theoretical physicist at the University of Oxford, UK. The results, which have not yet been peer-reviewed, were posted on the arXiv preprint server last week¹.

Known quasiparticles display a range of exotic behaviours. For example, magnetic monopole quasiparticles have only one magnetic pole — unlike all ordinary magnets, which

always have a north and a south. Another example is Majorana quasiparticles, which are their own antiparticles.

Anyons are even more strange. All elementary particles fall into one of two possible categories — fermions and bosons. Anyons are neither. The defining property of fermions (which include electrons) is Fermi statistics: when two identical fermions switch spatial positions, their quantum-mechanical wave — the wavefunction — is rotated by 180°. When bosons exchange places, their wavefunction doesn't change. Switching two anyons should produce a rotation by some intermediate angle. This effect, which is called fractional statistics, cannot occur in 3D space, but only as collective states of electrons confined to move in two dimensions.

Fractional statistics

Fractional statistics is the defining property of anyons, and the latest work — led by Michael Manfra, an experimental physicist at Purdue University in West Lafayette, Indiana — is the