News in focus

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Huge protests against socio-economic inequality have engulfed Chile since 18 October.

WHAT THE PROTESTS AND VIOLENCE IN CHILE MEAN FOR SCIENCE

As universities shut down, researchers are demonstrating — and meeting with lawmakers to work out whether science can help to solve socio-economic inequality.

By Emiliano Rodríguez Mega

A few seconds after a tear-gas canister burst near Marcelo Jaque's feet, breathing became nearly impossible. Jaque, an astronomer at the University of La Serena in Chile, ran with his partner to safety as fellow protesters began choking and vomiting or fell unconscious. What moments earlier had been a peaceful demonstration dissolved into chaos as police forces tried to disperse the crowd.

The demonstration in La Serena on 21 October was part of a nationwide upheaval that started three days earlier owing to a metro fare hike in Santiago, which sparked mass protests across the country. The increase of 30 Chilean pesos (US$0.04) was the last straw for people fed up with decades of socio-economic inequality and government corruption. Protesters point to ongoing problems including tax-fraud scandals, the soaring cost of education and health care, and the lack of dignity with which they say minority groups have been treated.

The demonstrations have since become violent, with news reports of some protesters setting government buildings on fire and police officers and the military using tear gas, water cannons and rubber bullets to disperse the crowds. The clashes show little sign of slowing.

Researchers in Chile share the concerns and frustrations that have sparked the protests — and many, like Jaque, have joined in. But they also realize that the country's scientific community is a privileged group, and bears some responsibility for helping to perpetuate the current political and societal situation. This has prompted some researchers to meet with

government officials to help address Chile's socio-economic issues.

"It's not about 30 pesos; it's about 30 years," says Carolina Rojas, a geographer at the Pontifical Catholic University of Chile in Santiago, who supports the protesters. Government policies have widened the socio-economic gap among Chileans since 1990, when the country emerged from a brutal dictatorship. One per cent of the wealthiest people in the country earn 33% of the nation's income, whereas nearly 70% of Chilean workers earn $500 or less per month. Rojas's mother, a retired elementary-school teacher, receives a monthly pension of $150, Rojas says.

Since late October, several universities have temporarily closed their doors in response to safety concerns and an eight-day government-imposed curfew — as well as to allow students to participate in the protests. The turmoil has also led to a change in venue for a global climate summit scheduled for 2–13 December from Santiago to Madrid, Spain. "Mentally, it's really difficult to work these days," says Jaque.

Most worrying for everyone, including researchers, is the escalating violence. In its most recent count, released on 6 November, Chile's National Institute of Human Rights reported that more than 1,700 civilians had been taken to hospital after being injured in the demonstrations. And more than 1,000 members of the security forces across the country have been injured, according to the police.

The violence hasn't stopped the protests, but many people are frightened. "I think we're all fearful," says Facundo Gómez, an astrophysicist at the University of La Serena, which cancelled classes on 21 October and has yet to restart them. On 28 October, Gómez and his colleagues posted a letter online protesting against the 22 October detention of three students from their institution.

Finding a way forward

Chilean President Sebastián Piñera reversed the metro-fare increase soon after the initial riots. But protesters are demanding broader, deeper changes to the country's economic and political system. Many are even pushing for a new constitution to replace the current one, which was instituted during the dictatorship.

So far, the only attempt by lawmakers to start a dialogue with citizens has been a series of meetings with researchers set up by the science and technology commission in Chile's Senate. From late October, around 50 scientists spoke to senators on the commission about how to address socio-economic problems.

They agreed that change will require input from a cross-section of society, but that the scientific community needs to do its part. Some researchers say that reforming how science is funded could help. One nascent idea includes changing how scientists are evaluated for government funding so as to prioritize research that might improve the country at a national or local level, says Claudio Gutiérrez, a computer scientist at the University of Chile in Santiago who has participated in the protests. This would encourage more researchers to work on projects that benefit Chileans, such as solving the country's current water crisis or studying the poorest populations near big cities in order to help them, he says.

Others, such as Cecilia Hidalgo, a biochemist at the University of Chile and president of the Chilean Academy of Science, view the moment as an opportunity to increase federal research spending and bolster science in the country. As of 2017, the latest year for which data are available, Chile spent roughly 0.4% of its gross domestic product on science and technology, compared with an average of 0.6% for countries in Latin America and the Caribbean.

But some point out that this might benefit only scientists. "To increase the budget for what?" Gutiérrez asks. "So that the country's 10 or 15 major research centres keep publishing, making agreements with international agencies and the rest of the country remains the same?"

Rojas thinks that the protests will permanently change Chile, although she can't say how. It's imperative that the scientific community decides how best to participate in the country's future, she says. "We can't let [Chile] fall apart," Rojas adds. "That might mean postponing research projects or publications. But it seems to me that the country is more worthwhile."

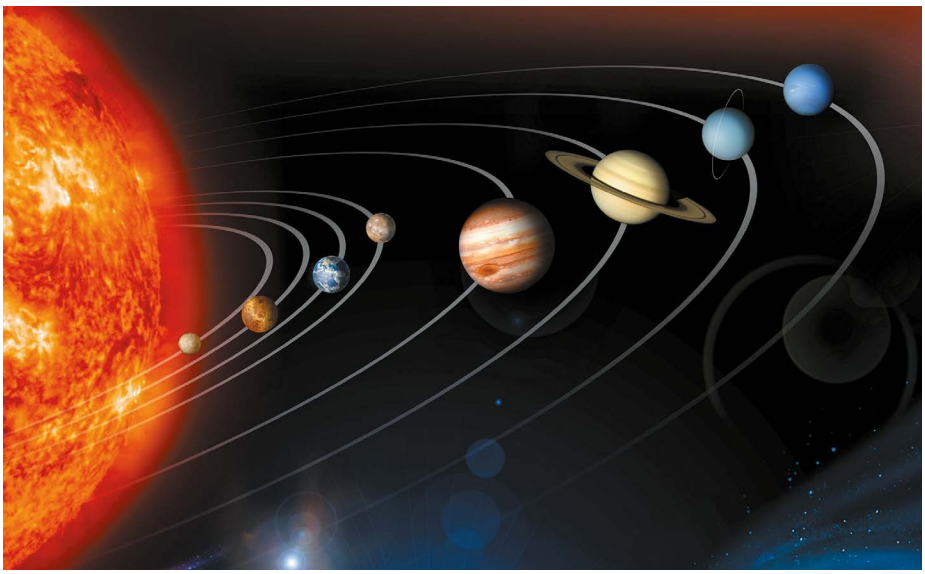
AI COPERNICUS 'DISCOVERS' THAT EARTH ORBITS THE SUN

Neural network that teaches itself the laws of physics could help to solve quantum-mechanics mysteries.

By Davide Castelvecchi

Astronomers took centuries to figure it out. But now, a machine-learning algorithm inspired by the brain has worked out that it should place the Sun at the centre of the Solar System, on the basis of how movements of the Sun and Mars appear from Earth. The feat is one the first tests of a technique that researchers hope they can use to discover new laws of physics, and perhaps to reformulate quantum mechanics, by finding patterns in large data sets. The results are due to appear in *Physical Review Letters* (R. Iten *et al. Phys. Rev. Lett.*; in the press).

Physicist Renato Renner at the Swiss Federal Institute of Technology (ETH) in Zurich and his collaborators wanted to design an algorithm that could distil large data sets down into a few basic formulae, mimicking how physicists come



NASA/JPL/SPL

Physicists have designed an AI that realizes the Sun must be at the centre of the Solar System.