of Tokyo, found that spike proteins bearing the P681R change fuse with the plasma membranes of uninfected cells — a key step in infection — almost three times faster than do spike proteins lacking the change[3].

"I think the virus is succeeding on volume and speed," says Whittaker. "It's become a much more efficient virus. It's going through people and going through cells a lot quicker."

More than one mutation

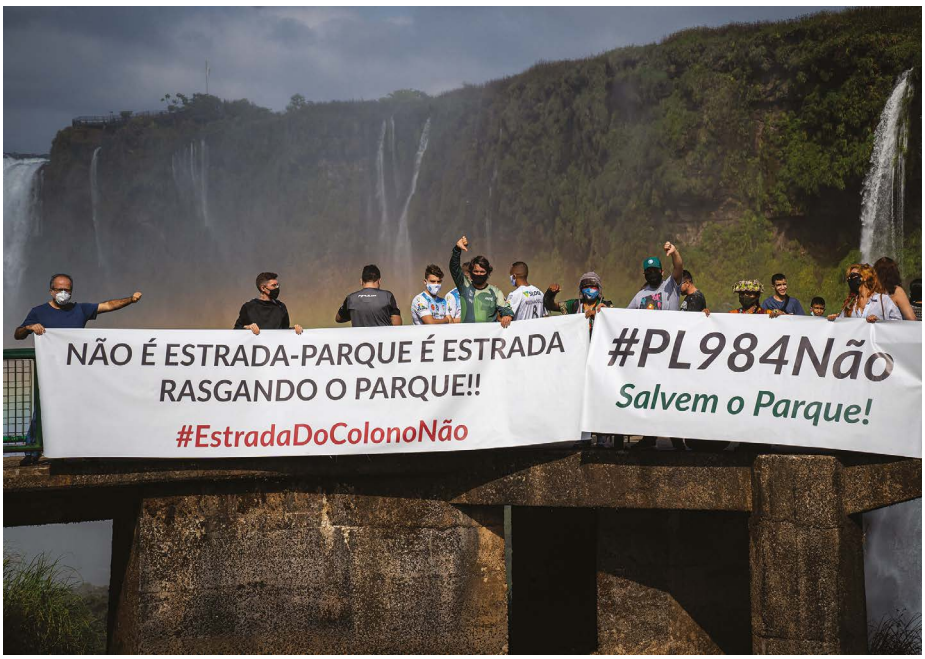
Although evidence is building that the P681R change is a crucial feature of Delta, researchers emphasize that it is unlikely to be the only mutation responsible for the variant's fast spread. Delta carries numerous other mutations to the spike protein, as well as to other, less well-studied proteins, that might be important. "It's very simplistic to say it's just this 681 change. I think it's a sum of everything," says Teresa Aydillo-Gomez, a virologist at Icahn School of Medicine at Mount Sinai in New York City.

The epidemiological and genetic context of the mutation is also important to Delta's rise, say scientists. One of Delta's siblings, a variant called Kappa that, like Delta, was first identified in India, carries many of the same mutations, including P681R, but its effects haven't been as devastating as Delta's. In a preprint posted on 17 August, a team led by structural biologist Bing Chen at Harvard Medical School in Boston, Massachusetts, reports that Kappa's spike protein is cleaved less frequently and fuses to cell membranes much less efficiently than does Delta's[4]. The researchers say this finding raises questions over the role of P681R.

Researchers in Uganda identified the P681R change in a variant that spread widely in the country in early 2021, but that never took off as Delta did, even though it displays many of the same properties in cell-based laboratory studies. Whittaker's team inserted the P681R change into a spike protein from the coronavirus that was circulating in Wuhan, China, at the beginning of the pandemic, and found no increase in its infectivity[5]. "It takes more than one mutation to make a difference," he says.

Regardless of its role in Delta's dominance, Whittaker and other scientists say, the mutation has underscored the importance of understanding changes in the coronavirus's furin cleavage site. Whittaker doesn't expect P681R to be the last furin cleavage site mutation to cause concern. "I'm waiting to see what happens next."

1. Liu, Y. *et al*. Preprint at bioRxiv https://doi.org/10.1101/2021.08.12.456173 (2021).
2. Peacock, T. P. *et al*. Preprint at bioRxiv https://doi.org/10.1101/2021.05.28.446163 (2021).
3. Saito, A. *et al*. Preprint at bioRxiv https://doi.org/10.1101/2021.06.17.448820 (2021).
4. Zhang, J. *et al*. Preprint at bioRxiv https://doi.org/10.1101/2021.08.17.456689 (2021).
5. Lubinski, B. *et al*. Preprint at bioRxiv https://doi.org/10.1101/2021.06.30.450632 (2021).



MARCOS LABANCA

Protesters oppose the Caminho do Colono at Iguaçu Falls.

BRAZILIAN ROAD PROPOSAL THREATENS BIODIVERSITY HOTSPOT

Researchers say the road, slated to pass through Iguaçu National Park, could harm ecosystems.

By Meghie Rodrigues

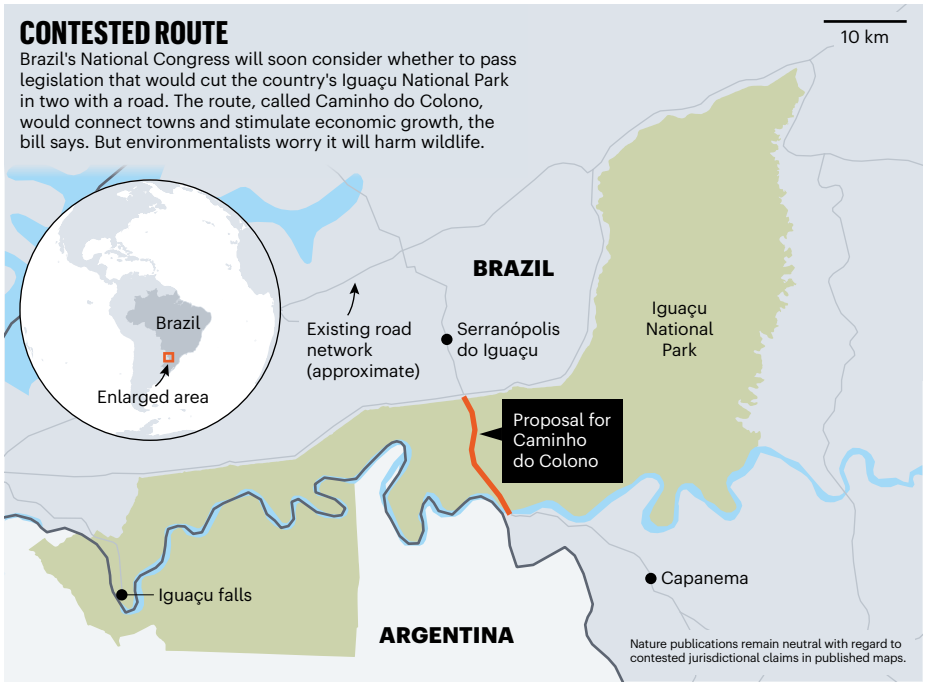
Brazil's National Congress could soon vote on a bill proposing to construct a road through the country's Iguaçu National Park. If the proposal moves ahead, researchers fear that it will threaten the park's lush forest, a biodiversity hotspot that is home to almost 1,600 animal species, including endangered animals such as the purple-winged ground dove.

Environmentalists and researchers have fought off construction of the 17.5-kilometre road for years, arguing that it will bring not only pollution to the park, but also poachers, who would threaten animals such as jaguars and tapirs. Even research in the park could be affected. In a portion of the park that dips into Argentina, for example, "poachers often steal our cameras", says Julia Pardo, a mammal conservation and ecology researcher at the Institute of Subtropical Biology in Misiones, Argentina.

Under the leadership of President Jair Bolsonaro, Brazil's government has weakened protection of the country's forests in favour of industries such as mining, logging and ranching. The lower house of Brazil's Congress, the Chamber of Deputies, put the bill on a fast track in June, allowing it to skip regular debate among its committees and head straight for a vote — a move that has researchers worried.

If passed, the legislation would establish a dangerous precedent that could weaken environmental law in Brazil, says Sylvia Torrecilha, a biologist at the Secretariat of Environment, Economic Development, Production and Family Agriculture in the state of Mato Grosso do Sul. In addition to cutting Iguaçu Park in two with a road that will connect towns to its north and south (see 'Contested route'), the bill seeks to create a new type of protected area — the *estrada-parque*, or park road — in Brazil's System of Natural Conservation Units, which regulates environmentally protected areas. Approving the construction of the 'Caminho do Colono' (the Settler's Road) in Iguaçu could literally pave the way for creating throughways in other parks and conservation areas in Brazil, says Torrecilha.

Normally, the idea of a park road is to preserve the green areas along an already-existing scenic route, she says, not to bring commercial or economic advancement to a state — the argument lawmakers have



made in favour of the road. The proposal, from its very beginning, is "inappropriate", she adds.

A historical route

Established in 1939, Iguaçu National Park is famous for the waterfall — one of the world's largest — on the border with Argentina along its southwestern tip. But it is also notable because it contains the largest remaining patch of Atlantic Forest in southern Brazil. Although less well-known than the Amazon rainforest, the Atlantic Forest is rich in plant and animal species, and originally stretched along the coast of southeastern Brazil and down to Argentina and Paraguay. However, the forest is rapidly disappearing: it has lost almost 90% of its tree cover, accelerated by deforestation from urbanization, and agricultural and industrial activities in the twentieth century.

Because of these attributes, the park was designated as a World Heritage Site by the United Nations cultural organization UNESCO in 1986.

If the legislation is successful, it will actually enable the creation of the Caminho do Colono for the second time. The government of Paraná, the state where Iguaçu National Park is located, transformed an existing walking path into an unpaved version of the road during the 1950s. "Nobody cared much at the time because there wasn't much difference between the inside and the outside of the park, as the Atlantic Forest stretched all over the place," says former park chief Ivan Baptiston. "With all the deforestation of the last decades, nowadays, the scenario is a lot different."

In 1986 — the same year the park received its UNESCO World Heritage Site designation — Brazil's Federal Prosecutor's Office filed a civil suit to close the road, and the following year, a federal judge officially closed it. Since then, vegetation has overtaken the route, and some local residents have tried and failed to force it back open, claiming economic hardships associated with not being able to travel efficiently through the area.

The new bill states that re-establishing the road would offer a "solution to a logistical problem in Paraná state". Sponsored by Nelsi Coguetto Maria, a member of the Chamber of Deputies, the proposal also says it "answers a decades-old outcry of Paraná inhabitants, salvaging the region's history and its socioeconomic, environmental and tourism relations".

"Whoever doesn't understand the impact of a proposal like this doesn't understand biodiversity."

Environmentalists have criticized Coguetto Maria for backing the bill. And local media outlets have reported that his family potentially stands to gain from the Caminho do Colono: two of his sons are partners in construction companies that could pave the road. Coguetto Maria's office did not respond to *Nature*'s queries about this, or about researchers' concerns over the road. When the Chamber of Deputies approved fast-tracking the bill, he argued that the Brazil of today is "responsible", and has the "competence and capacity to build an ecologically correct road", pointing out that the road existed as a walking path before the park was even created.

For many conservationists and researchers, the economic argument for opening the road doesn't hold water. The damage caused to the park's highly valued Atlantic Forest would far outweigh the potential economic gains for the surrounding towns, they say (R. A. Ortiz *Ambientalia* **1**, 141–160; 2009). Furthermore, the species protected by the park are irreplaceable, they add. Iguaçu is the only location in the world where the jaguar population is increasing instead of declining. If the road opens, says Pardo, pressure on the animals will skyrocket. "Easy access is the main enabler for poachers," she says.

Research interrupted

Cars using the road will also cause air, soil, water and even sound pollution, says Victor Prasniewski, a conservation biologist at the Federal University of Mato Grosso in Cuiabá, Brazil. Sound pollution, in particular, changes communication patterns among a number of species. "Birds that attract females by singing will be forced to sing louder or longer to get noticed," says Prasniewski, who published a paper last year listing the potential negative impacts of the Caminho do Colono (V. M. Prasniewski *et al. Ambio* **49**, 2061–2067; 2020).

"These changes can affect the reproduction and even the evolution of some birds," says Carlos Araújo, a bioacoustics ecologist at Argentina's Institute of Subtropical Biology. "The building of a road would be catastrophic to research in my field," he says.

He works on a large-scale monitoring project looking for the purple-winged ground-dove (*Paraclaravis geoffroyi*), the last confirmed sighting of which was more than three decades ago. "It's a rare animal, and we leave recorders spread over the forest to try and catch her singing. We often capture helicopter noise, which disturbs our work." Cars and trucks on the road would create similar low-frequency noise, he says. "It will be a lot harder to find birds like this dove."

For some, the argument that the road will enhance tourism in Paraná doesn't make sense either. Reopening the road, says Carmel Croukamp Davies, chief executive of Parque das Aves, a private bird sanctuary and shelter near the park, could threaten Iguaçu's UNESCO World Heritage title if it damages the park's biodiversity and severs the Atlantic Forest. Visitors come because they want to experience nature, she adds: "Whoever doesn't understand the impact of a proposal like this doesn't understand an inch of tourism nor biodiversity."

With Brazil's Congress having returned from holiday earlier this month, the bill could soon be put to a vote. And when it is, environmentalists worry it will be passed, given how many representatives in the Chamber of Deputies currently align with Bolsonaro. Then it would face the Senate, and finally, Bolsonaro, who is ultimately expected to approve it.