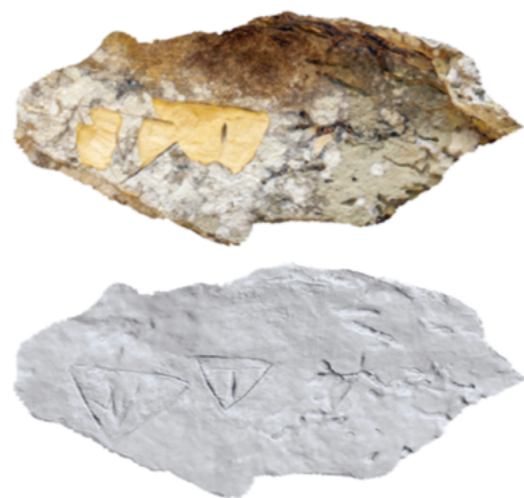


FACTUM FOUNDATION'S  
RECONSTRUCTION OF KAMUKUWAKÁ CAVE



Colour render of an area of the cave after the attack; black and white render of the digital restoration. © Factum Foundation



View through the cave from the main rock art panel. Photo: Jean Nunes

“The Kamukuwaká cave is a sacred place of great significance for all the Wauja and the people of the Upper Xingu. In that cave, the teachings of our ancestors, the Kamukuwaká people, are engraved on the rockface. Kamukuwaká is our history, our culture, and that is why it is so important for the Wauja people. Every year, we visit the Kamukuwaká cave. Every year, we see the garbage on the riverbanks, the sand building up in the cave and covering the engravings, the fish dwindling. This year, when we visited the cave, what we feared the most had taken place. The engravings in the cave had been vandalised. The fragments were lying on the ground.”

*Akari Waura, leader of the Wauja indigenous community*

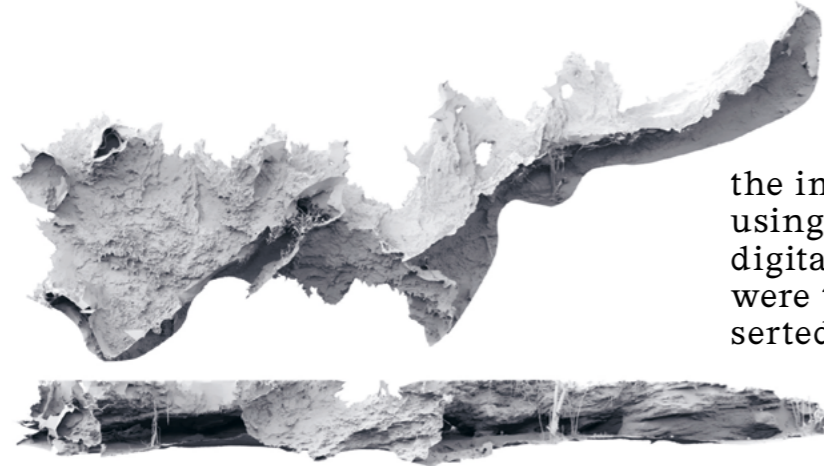
In 2018, when digital conservation organisation Factum Foundation went to record the Kamukuwaká cave in central Brazil, they found the ancient petroglyphs in a state of ruin. The mythical stories carved

into the stone, which are used to tell oral histories, had been deliberately hacked away with a chisel, erasing thousands of years of history. This symbolic act of vandalism, inflicted upon artefacts synonymous with the collective memory of the Wauja peoples, had a particularly damaging effect on the local community.

The reasons behind this act are unclear, but there are political issues at play that hint at an answer. The cave is located on the border to the Xingu region, in an area of Brazil where recurring disputes over agricultural development are common. This large expanse of demarcated land has traditionally been used to house indigenous groups displaced from their former ancestral territories. However, in the recent past, the agricultural industry has been keen to expropriate the land – located on fertile grounds between a river and a forest – in order to expand agricultural production.

For decades, the Wauja community have been seeking to protect the cave, and most recently were confronted with a planning application on the site of the sacred Batovi river (which runs beside the cave) from prospective miners. No direct links to this unrest have been proven, but the violence inflicted on the cave that quickly followed brings to mind similar forms of aggression attempting to delegitimise indigenous groups. It equally demonstrates the uneven power balance that exists between the production industry in Brazil and local communities.

Factum Foundation were quick to respond, and since the team's visit, they have been working on digitally and physically restoring the Kamukuwaká cave. They began by documenting the current site using a combination of high-tech laser scans and photogrammetry (the stitching together of 2D photographs to create 3D data). This high-resolution recording played a pivotal role in the next phases



Render of the cave and its entrance, produced using the data from LiDAR scanning and photogrammetry recordings. © Factum Foundation

of the restoration. The team then compiled a database of photographs crowd-sourced from academics and archaeologists who had previously visited the site. Working closely with the Wauja community, including sending them the initial restoration to correct, they painstakingly paired the images to each damaged area. And using a combination of height maps and digital sculptural techniques, 3D models were then generated that could be re-inserted into the digital replica of the site. Having completed all this work, they were finally able to translate the digital copy into a physical form, producing an exact reconstruction of the cave.

By October 2019, with the replica finished, representatives from the Wauja community were invited to Factum Foundation's workshop in Madrid to celebrate its completion and lead discussions about what to do next. In this meeting, they decided that before returning the cave to Brazil, the model should travel the world as a symbol of their struggle against the agricultural industry



Securing sections of the recreated cave into place in Factum Foundation's workshops. Photo: Oak Taylor Smith for Factum Foundation

and as a platform to communicate and share their cultural identity. This project is an example of the pertinent work Factum Foundation are doing using new technologies to document, preserve and restore our cultural heritage. It is work that the not-for-profit and its sister organisation Factum Arte have been doing for more than 20 years, with previous projects ranging from recreating a facsimile of Paolo Veronese's *Wedding of Cana* to digitally scanning the Hereford *mappa mundi*. Most recently, they travelled to



Detail of the 3D model of the damaged cave, created with the data acquired from LiDAR scanning and photogrammetry recordings. © Factum Foundation

Easter Island to digitally record artefacts from the Moai and Birdman cultures. In the case of the Kamukuwaká cave, their efforts will now ensure that the site can continue to be used as a place of history, education and cultural memory for generations to come.

Among those most closely affected by the events leading to the project, Factum Foundation's reconstruction represents a vital opportunity to maintain and share aspects of the Wauja culture that they feared had been lost. "These actions of restoration are not artificial; what is artificial is having to fight against deforestation, against weapons of war, against agro-toxics, against bad people," indigenous activist Shirley Djukurnã Krenak said at the unveiling of the cave in Madrid. "Being able to show it in Madrid is very important to the Wauja: people will learn about us, about who we are, where we come from and how we live. They will learn about our history and our struggle, and perhaps they will be able to join us in the fight to protect the cave, the river and our culture."



A member of the Wauja community at the cave prior to vandalism. Photo: Vilson de Jesus

*Lucas Giles is an editor of this magazine*