

# Scope

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## THE MEDICAL MAGIC OF MUSHROOMS





# Disaster Artist

Archaeologist  
and volcanologist  
Karen Holmberg  
has spent much  
of her career  
consumed with  
catastrophic  
thinking. She  
wonders why the  
rest of us aren't  
paying more  
attention  
too

By Alison Gwinn

The Chaitén volcano  
erupted unexpectedly in  
Chile, where Holmberg  
leads conservation efforts  
as the town recovers.

Scientists are supposed to be dispassionate—but not Karen Holmberg. She has been infatuated with volcanoes ever since she was in grade school. The NYU volcano expert and archaeologist sees them as foundational to our lives on the planet: not only a potential source of early life and the atmosphere we breathe, but also the cause of every major extinction-level event Earth has ever experienced. “Volcanic landscapes provide a proxy for the sudden, radical environmental changes that humans have experienced for millions of years,” Holmberg says, “and also a way to study how messy the nature-culture divide is in the past, present, and future.”

Holmberg passes such lessons onto her students at the Gallatin School of Individualized Study, where she is the only research scientist as well as codirector of the Gallatin WetLab, an experimental space housed on Governors Island that’s part exhibition gallery and part laboratory where art meets science. And as an environmental science teacher, Holmberg has developed a wide range of sui generis courses, like *Volcanoes: The Sublime and Scientific* as well as *NYC Coastlines: Past, Present, and Future*, a mashup of archaeology, climate change, science, and science fiction.

Holmberg’s efforts, both in the classroom and in the field, are a natural outgrowth of her childhood on a Chesapeake Bay farm, when her mother was an early environmentalist and her father was one of NASA’s first aerospace engineers. In that intellectually rich environment, she says, “there were lots of books on our shelves.” One that caught her fancy at age 7: explorer Richard Halliburton’s *Complete Book of Marvels*, particularly its chapter on Vesuvius. “I literally said, ‘That’s it. I want to be an archaeologist and a volcanologist,’” she recalls.

After high school, Holmberg did fieldwork at Thomas Jefferson’s Monticello before earning her undergraduate degree in archaeology at the University of Virginia, then took a two-year break to work as a model—and travel the world. She later earned a combination MA, MPhil, and PhD at Columbia, with a focus on the long-term intersections between human life and radical environmental changes.

That focus continues in Holmberg’s projects today, including her research at two volcanic sites: one at Chaitén, Chile, where she is the principal investigator for a National Geographic Explorer grant, and one at Campi Flegrei, near Naples, Italy. Both reflect her contextual view of volcanoes: “They are not just geophysical entities but also have great resonance as cultural touchstones for the communities around them,” she says.

The Chaitén volcano’s unexpected eruption on May 2, 2008, was dramatic. The ash and steam rose up to 55,000 feet, higher than the cruising altitude of commercial airliners, disrupting air traffic in South America and prompting the largest evacuation in Chile’s history. Residents in nearby Chaitén—unaware that the volcano

wasn’t just a mountain until it suddenly erupted—were whisked away in navy boats. “The entire town was evacuated within two days without direct loss of life,” Holmberg says, “but people still lived as environmental refugees for multiple years before resettling.” Since then, conservation has been ongoing to keep a record of the destruction, including preserving a row of houses that were buried in ash as local heritage sites. “It is complicated to conserve ruins as the degradation process continues,” Holmberg says. “Do you return the houses to the state they were in the day after the eruption or at the point when conservation began?” One possibility, in lieu of preserving entire structures, she says, is maintaining the facades of the houses and turning the area behind them into an open museum safe for visitors.

**“You’re not supposed to be able to see somebody’s bread from 2,000 years ago, to read their graffiti, to see their furniture. It slams you in the face that these were real people.”**

While surveying the site near the volcano, a prehistoric complex of four rock art caves was discovered. Within them were dozens of designs (including dots, lines, and a sun) painted in red iron oxide, piles of shells, ceramic and stone materials, human and animal remains, and triangular etched designs archaeologically interpreted as vulvas. Holmberg’s work at Chaitén has included standard archaeological excavation of the caves, innovative 3D digital imaging, acoustic data collection, and cultural and geological heritage work.

Holmberg also serves on the board of a new museum at Chaitén that commemorates the 2008 eruption, conveys the area’s prehistoric human presence (through her findings in the field), and highlights the future risk to residents, as the rebuilt town is in the path of possible volcanic flows. The museum includes a spot where visitors can immerse themselves in 3D visualizations showing the regrowth of trees on the volcano’s slopes, the coastline leading to the cave, and the rock art within the cave. “Including the cave imagery is important to me because it increases the accessibility to the cave for those who cannot get there,” she says. The museum also includes a model of the volcano that allows for digital recreations of different stages of the eruption, and a residency space for artists and scientists.

Such ventures have long-term implications. “Disasters can accelerate or lay bare social processes and inequalities that already exist,” Holmberg says. “They can be points of utter



Holmberg’s field shots from Chile’s Osorno volcano ...



... and volcanic Laguna del Maule



The eruption of the Chaitén volcano

destruction but also provide the chance to create new ways of being. What I find interesting is the creative or imaginative element of catastrophic events. In the past, disasters were often recorded through various art forms. In the contemporary and future, art science and citizen science can be powerful tools to better understand and convey the natural world and how it intersects with our human perception of it.”

Holmberg’s work at Campi Flegrei, or “burning fields,” takes place less than an hour west of one of history’s most infamous volcanic disasters: the burying of Pompeii in 79 AD. “Pompeii was so important in the Western imagination,” she says, “because it was culture threatened by nature: Vesuvius, which was hovering over the city like a monster.” Why do the town’s artifacts, many of them since uncovered, still fascinate us? To Holmberg, the answer has less to do with science and more to do with humanity: “You’re not supposed to be able to see somebody’s bread from 2,000 years ago, to read their graffiti, to see their furniture. It slams you in the face that these were real,

embodied people, not some sort of fever dream.”

But Campi Flegrei is actually much more dangerous than Vesuvius, she says. “With Campi Flegrei, you have 360,000 people living inside a gigantic volcanic crater, two-thirds of it underwater, who don’t even understand it is a risk because it’s so large they don’t see it. And that is a metaphor for climate change.” Along with collaborators, Holmberg is thinking about how environmental risks are perceived and how to better convey scientific understandings of possible future events. “Drawing from the well-developed literature around the Theatre of the Oppressed, we are thinking toward something we’re tentatively calling a Theatre of Urgency,” she says. “I see this as a test case for climate change writ large: the problems feel so massive and insurmountable that it becomes easier to push them aside.”

Holmberg sees similarities between those volcanoes and the megacity she calls home, where she is working with Gallatin students doing citizen science (water quality testing, oyster monitoring, and species identification); studying remains at the New York City Archaeological Repository, especially from landfilled parts of Manhattan; and looking at the various flood mitigation plans under consideration by the city. “What do you do in a coastal city that’s dependent on outdated infrastructure when much of Lower Manhattan will be potentially submerged within a generation?” she asks. “The changes are happening fast, and looking at the differences is really interesting when the problems are human-induced as opposed to a volcanic eruption.”

In other words, how humanity has reacted to volcanoes in the past can inform how we deal with climate crises now and in the future. “Sites of past disasters, like Chaitén, can regenerate and become sites of resilience and renewal,” she says. “The crises we face in the 21st century are quite literally existential and yet the future is not predetermined. We have the agency, intelligence, and creativity to redirect the current climate narrative. We have a responsibility to one another and to our planet to do so.”