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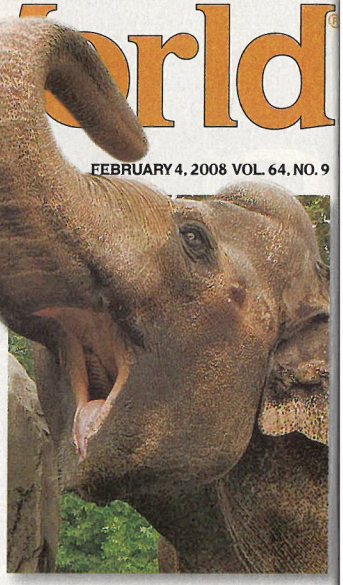


Features

Departments

IN THE SHADOW OF A

THAR SHE BLOWS: Vesuvius last erupted in 1944 during World War II. Ash fallout destroyed many allied planes and lava buried two towns.

Mount Vesuvius is one of the most dangerous volcanoes in the world. If it erupts, it could threaten the lives of more than half a million people.

POPULATION BOOM: Three million people live in close proximity to Mount Vesuvius, an active volcano in Italy.

A Volcano

Near the city of Naples, on Italy's western coast, millions of people live at the foot of a sleeping giant—Mount Vesuvius. The mountain is one of the world's most infamous and dangerous volcanoes. Even though it has been silent for 64 years, "Vesuvius will erupt again, and people living in its shadow need to be prepared," says Lucia Gurioli, a volcanologist at the University of Hawaii.

When the volcano does go off, scientists fear the eruption could be more damaging than the one that buried the nearby city of Pompeii and killed thousands of people in 79 A.D. (*see Blast From the Past, p. 19*). The risk posed by Vesuvius is greater today because 18 towns exist around it. Scientists are trying to learn how and when Vesuvius might erupt and devise safety plans before it suddenly wakes up.

DISASTER-PRONE

Even while Vesuvius slumbers, the makings of the next eruption are happening deep underground. Beneath the volcano are two shifting *tectonic plates*. As these sections of Earth's *crust*, or outermost layer, collide, one plate sinks down into the *mantle* (layer below the crust). High temperatures in the mantle cause the plate to melt, forming *magma*.

The magma is less dense than the surrounding rock, so it rises toward Earth's surface. There it fills chambers located miles beneath the volcano. If the magma keeps inching upward, the volcano will eventually erupt. The last time that happened was in 1944, when rivers of molten rock oozed out of the volcano. People

TOP: CUBOIMAGES SRL/ALAMY; LEFT: KEYSTONE/GETTY IMAGES; MAP: JIM MCMAHON

easily escaped the slow-moving lava, but those living on Vesuvius's slopes haven't always been so lucky.

Besides small lava eruptions, Vesuvius is known for explosively blowing its top. The blast that buried Pompeii nearly 2,000 years ago spewed a column of ash 32 kilometers (20 miles) skyward. The fiery plume then sent deadly currents of hot gas and debris racing down the mountainside. These *pyroclastic flows* can travel at speeds of 100 km (60 mi) per hour and reach temperatures of 400°C (752°F), destroying everything in their paths. "There is little chance of surviving a pyroclastic flow," says Gurioli.

EXPLOSIVE SITUATION

Despite the danger, more people call Vesuvius home than ever before. "People have built higher and higher up on the mountain, almost to the crater," says Haraldur Sigurdsson, a volcanologist at the University of Rhode Island.

Why risk living so close to this ticking time bomb? "Vesuvius has been quiet for such a long time that many people think they can safely live there for the rest of their lifetime," says Sigurdsson. But the volcano's peaceful appearance might actually disguise a catastrophe brewing below. "The longer Vesuvius remains inactive, the more likely the next eruption will be a big one," says Sigurdsson.

Scientists now know there is a pattern to the volcano's eruptions. After a period marked by lava flows, Vesuvius slumbers—then kaboom! Today, a rocky plug blocks the volcano's opening, signaling an end to its lava eruptions. This plug allows magma and gases, like water vapor and carbon dioxide, to build up inside the volcano. When Vesuvius finally pops its cork, the escaping gases likely will cause the magma to violently explode.

OUT OF THE ASHES

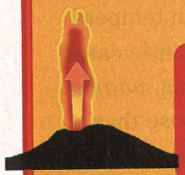
Because of the long time between some volcanoes' eruptions, scientists don't often get a chance to witness their explosions firsthand. Instead they rely on geological clues left by earlier eruptions. Scientists studying the layers of ash and *pumice*, or volcanic rock, covering sites like Pompeii can reconstruct Vesuvius's past eruptions almost minute by minute. "It's very important to unravel the history, because it always repeats itself," says Sigurdsson.

By analyzing volcanic deposits, volcanologists like Gurioli have been able to learn how pyroclastic flows behaved. They've mapped out the paths taken by the avalanches of poisonous gases and rocks, and even determined the flows' temperatures and speeds.

All this information can be used to create computer simulations of a possible eruption. These three-dimensional models can show what areas of the *Red Zone*, the 7-kilometer (5-mile) radius around Vesuvius, will be hardest hit. The models also help emergency planners determine the best way to clear out cities before the volcano starts rumbling.

nuts&bolts

Vesuvius's next eruption will likely be an explosive one. Augusto Neri at Italy's National Institute of Geophysics and Volcanolgy uses computer simulations to determine the impact of an eruption.



STAGE 1: A column of ash and pumice explodes from the volcano, causing ash to fall on towns.

STAGE 2: The column collapses, sending pyroclastic flows down the mountainside.

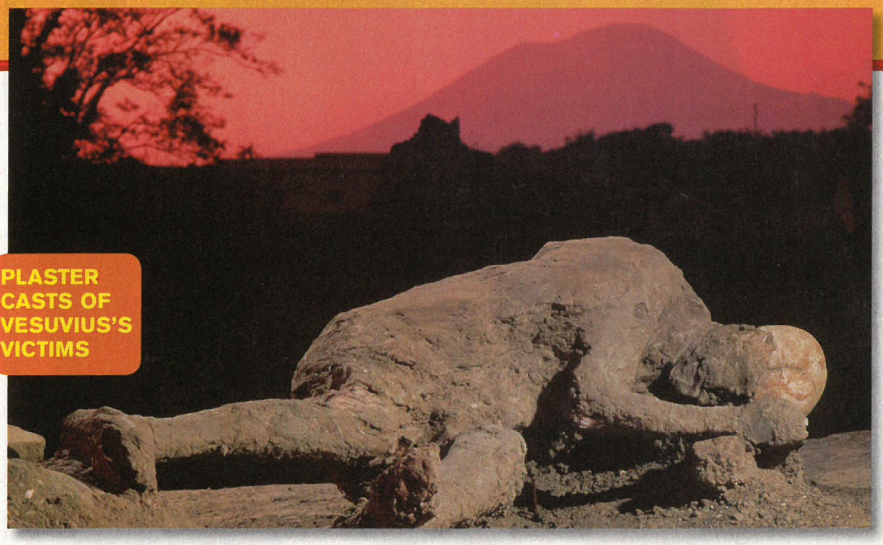
Blast From the Past

UNCOVERED RUINS OF POMPEII

Mount Vesuvius's most infamous eruption occurred on August 24, 79 A.D., destroying the ancient Roman cities of Pompeii (*ruins shown left*) and Herculaneum. At the time, a 17-year-old student named Pliny the Younger witnessed the power of Vesuvius from across the Bay of Naples and wrote a detailed account of the event.

"I looked round: a dense black cloud was coming up behind us, spreading over the Earth like a flood," wrote Pliny. Vesuvius's explosion took the Romans by surprise. Thousands of people were burned, suffocated, or were trapped inside collapsing buildings.

In a matter of hours, Pompeii was buried under several feet of ash and rock. Graffiti on walls, food in ovens, and even impressions of victims' bodies were preserved beneath the debris. Plaster casts of these cavities (*below*) and Pliny's accounts have allowed *archaeologists* (scientists who study the remains of past civilizations) and volcanologists to learn about daily life in the shadow of a volcano up to the very end.



PLASTER CASTS OF VESUVIUS'S VICTIMS

PREDICTING AN ERUPTION

The only way to protect people from Vesuvius's pyroclastic flows is to get everyone to a safe distance from the volcano. The Italian government estimates it would take a week to evacuate all 550,000 people from inside the Red Zone. Whether that will be enough time depends on how much warning Vesuvius gives before it erupts.

Fortunately, "Vesuvius is one of the most closely monitored volcanoes in the world," says Augusto Neri, director of the National Institute of Geophysics and Volcanology at Pisa, Italy. If magma is on the move, the volcano will shake, swell, and spout gases for days, weeks, even months before an eruption.

Scientists at the Institute have deployed hundreds of instruments, such as *seismometers* to measure earthquakes, and *tiltmeters* and *Global Positioning Systems* (*GPS*) that can detect whether Vesuvius's sides are shifting. Researchers also monitor gases escaping from vents called *fumaroles* to learn the composition of gases accumulating deep inside the volcano's magma chamber.

"Even with all these precursors, there is still only a 50 percent chance the volcano will erupt," says Gurioli. That makes the decision to evacuate a tough call for scientists and government officials who want to avoid unnecessarily uprooting more than half a million people.

Scientists' best hope to avert a disaster is to study the volcano and educate those living near it about their dangerous neighbor. "When people ask me, 'When will Vesuvius erupt?' I tell them, 'I hope not for another 100 years,'" says Gurioli. "That way scientists have a chance to understand more about what's going on and how to better predict the next eruption."

—Cody Crane

webextra

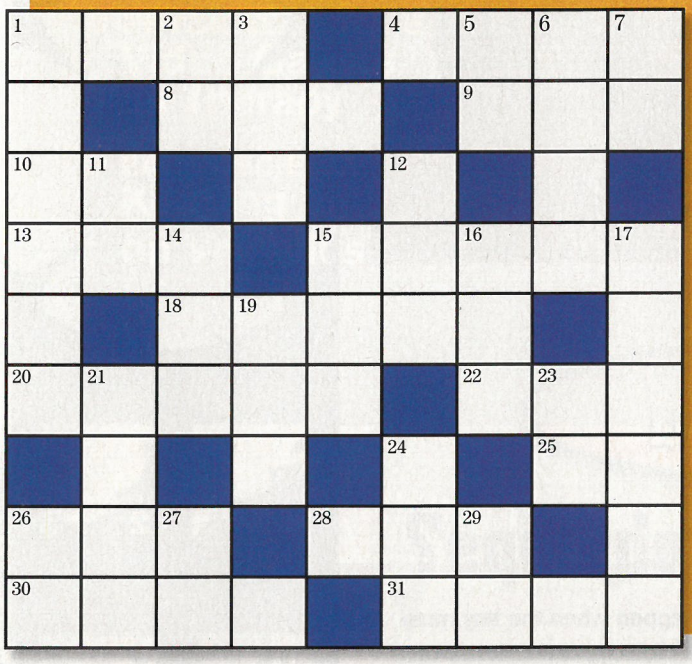
Visit: www.scholastic.com/scienceworld and click on "In This Issue" to see how scientists dig into Vesuvius's explosive history.

YOU CAN DO IT

WORD ROUNDUP

ACROSS:

1. Equipment
*4. Bull elephant's gender
*8. What fumaroles emit
9. Road paver
10. Aluminum (*chemical symbol*)
13. A lie
15. To shine
18. An occurrence
20. Velocity is ___ in one direction.
22. Metal container
25. Mountain (*abbr.*)
26. Country with 50 states (*abbr.*)
*28. Global Positioning System (*abbr.*)
*30. Archaeologists study __ civilizations
*31. Catheter: medical ___

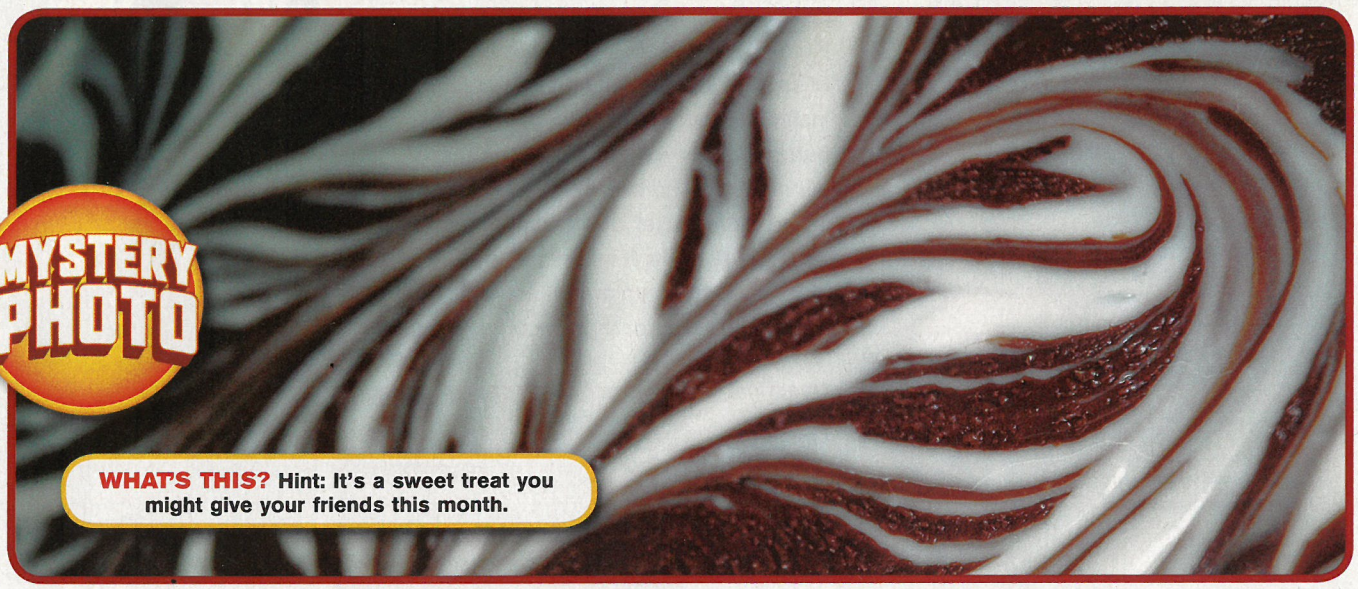


DOWN:

*1. Skin __ are transplants to grow new skin.
2. Silver (*chemical symbol*)
*3. Tusko's head was too huge to X-__.
5. Drill command: __ ease
*6. Erupted molten rock
7. Emergency room (*abbr.*)
11. Lithium (*chemical symbol*)
12. Million (*abbr.*)
14. Honey collector
15. General Equivalency Diploma (*abbr.*)
16. Et cetera (*abbr.*)
*17. Layer below Earth's crust
*19. Animal doctor (*abbr.*)
21. Leaning Tower of __
23. Opposite of p.m.
24. Apartment (*abbr.*)
26. Elevator button
27. Good __ new
29. Stanford University (*abbr.*)

**Starred clues relate to this issue's stories.*

MYSTERY PHOTO



WHAT'S THIS? Hint: It's a sweet treat you might give your friends this month.

DONNELLY MARKS