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New Mushroom Tile Mimics Elephant Skin to Cool Buildings Without Any Electricity

Story by Tudor Tarita • 4d • 3 min read

We've all felt the rising temperatures for the past few years. That oppressive heat radiating off concrete walls in the sun has been baking our skins, straining air conditioners, and swelling energy bills. But what if buildings could cool themselves, the way elephants do?

A team of scientists in Singapore has taken an unusual step in that direction. Drawing inspiration from elephant skin, they've created facade tiles out of fungi that can cool indoor spaces—no electricity required.

This creative setup hinges on mycelium, the dense root-like network that fungi use to explore the world around them. When combined with agricultural waste, this humble biological material becomes a natural insulator. Add the right texture—deep wrinkles, much like the folds in an elephant's hide—and it does something remarkable.

The micarcle Elephant Skin Tiles. Credit: Nanyang Technological University

A Natural Solution for a Global Problem

The construction sector is responsible for nearly 40 percent of all energy-related emissions. Much of that comes from keeping buildings cool in warm climates. Traditional insulation materials like polystyrene and fiberglass help, but they're often synthetic, non-biodegradable, and resource-intensive to produce.

“We’ve developed a promising eco-friendly alternative that transforms waste into a valuable resource while rethinking conventional thermal management materials,” said Associate Professor Hortense Le Ferrand of Nanyang Technological University (NTU) Singapore, who led the project. “This opens the pathway for more elephant skin–inspired designs.”

The concept, detailed in the journal *Energy & Buildings*, began with a question that veered into the wild: how do elephants keep cool without sweat glands?

“Elephants are large animals that live in hot and sometimes humid tropical climates,” said Dr. Anuj Jain, Founding Director of bioSEA, the biomimicry design firm that collaborated with NTU. “To withstand the heat, elephants evolved to develop a skin that is heavily wrinkled, which increases water retention and cools the animal by evaporation.”

That same idea—maximizing surface area and trapping cool air—was encoded into the tiles using computational design.

How the Tiles Work

To build the tiles, researchers used the mycelium of *Pleurotus ostreatus*, the oyster mushroom. They mixed it with bamboo shavings, oats, and water. This organic blend was packed into a hexagonal mold featuring a texture mimicking elephant skin. Over two weeks in darkness, the fungi grew through the mix, binding it into a solid, porous composite. After another two weeks of maturation, the tiles were oven-dried at 48°C (118°F), locking their shape and stopping further fungal growth.

Open the Youtube video

The result? A tile that looks like it was plucked from an elephant’s side, but behaves like a high-tech cooling device.

In lab tests, these tiles absorbed heat 25% more slowly than their flat counterparts. When placed on a hot plate set at 100°C (212°F), the bumpy surface heated up at 5.01°C per minute, compared to 5.85°C for a flat tile.

Cooling performance was also improved. When researchers heated one side of the tile, then exposed the other to ambient conditions—22°C (72°F) with 80% humidity—the textured version cooled faster. Its rate of heat loss was 4.26°C per minute, compared to 3.56°C for a flat tile.

Even more surprising, simulated rain enhanced the tiles’ performance. When water misted the textured surface, the tile’s cooling rate jumped to 7.27°C per minute—a 70% increase. Great success!

“The fungal skin that develops on the tile’s surface repels water, allowing droplets to remain on the surface rather than roll off immediately,” explained Eugene Soh, NTU researcher and lead author of the study. “This promotes evaporative cooling.”

Challenges and Future Steps

Despite the promise, hurdles remain. Each tile takes three to four weeks to grow. And while the process is energy-light, the slow pace and unfamiliarity of mycelium-based materials may deter widespread adoption.

To overcome this, the NTU team is partnering with a local start-up called Mykílio to scale up production and test the tiles on actual buildings. They're also experimenting with different strains of fungi and exploring ways to improve mechanical durability.

But the potential is clear. These fungi tiles rival synthetic insulation and might one day outgrow it, literally and figuratively. Their biodegradable makeup offers an end-of-life advantage that polystyrene can't match. And their design, rooted in one of nature's great survivors, may help our cities stay cool in an overheating world.

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