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**THE NATION**

## Environment inspires fresh home designs

### Experts weigh disciplines of natural world

By **Sharene Azimi**

Columbia News Service

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NEW YORK -- Termites might help to build your next house.

Oxymoronic as that may sound, the tiny insects are as ingenious at building structures as they are at destroying them, which is why an international team of researchers is spending three years studying African termite mounds in an effort to unlock their mysteries.

Observing termites is just one of the many ways that scientists and engineers are employing lessons of the natural world to produce better products.

Coming on the market is a house paint that resists mildew and a range of sticky objects, like bandages, that cling without conventional adhesives -- all inspired by nature. Some say these endeavors are part of a new interdisciplinary field called biomimicry, the science of imitating life. But according to one of the leaders of the termite project, the efforts are just the latest phase in what humans have always done.

"I've never considered myself as a biomimicist," said Rupert Soar, a mechanical engineer and researcher at Loughborough University in Loughborough, England, who is studying termite construction techniques. "Everything that science is copying nature. Where else would you get your ideas from?"

The classic example of biomimicry is the Velcro hook and loop fastener, which Swiss inventor George de Mestral devised more than 50 years ago after he and his dog came home from a walk covered in burrs. The two sides of the fastener mimicked the way the hooks of the burrs clung to the loops of de Mestral's clothing.

Today's nature-inspired inventions are different from those in the past because digital scanning technologies make it possible to understand on a much deeper level how natural and biological systems really work. Advanced computing and robotics make it possible to simulate and recreate those systems to address human needs.

For example, manufacturers got the idea for making water-repellent paint from a scientist who discovered how lotus leaves repel rain. Typically, raindrops roll off plant leaves because of their waxy coating. But in the lotus plant, the actual structure of the leaf causes water to form spherical droplets that pick up dirt and roll off, leaving the leaf clean and dry.

Working at the submicroscopic scale of nanoparticles, chemical engineers have been able to reproduce the properties of the lotus leaf in a variety of coatings. In May or June of this year, the European company Sto plans to introduce its line of Lotusan exterior paints into the U.S. market.

Buildings coated with Lotusan paint "look better for longer," said Michael Sweeney, spokesman for the company's U.S. division in Atlanta. The paint resists dirt, mold and mildew and is less likely to blister than regular paint,

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Sweeney says. It also retains its color better under sunlight.

The gecko is the inspiration for one of the more intriguing recent inventions. About five years ago, a group of researchers at Lewis & Clark College in Portland, Ore., discovered the secret behind the gecko's amazing ability to climb walls.

It is not because the hairs on their feet bear a sticky substance, as was previously thought, but because gecko feet have so many of these hairs that they compound the natural attraction between atoms and molecules, known as van der Waals forces, to literally defy gravity. In 2002 the researchers applied a mechanical model to this phenomenon to make a prototype of "gecko tape."

Kellar Autumn, a biologist who has been leading the gecko research at Lewis & Clark, predicts that within the next couple of years all sorts of products will be assembled with gecko tape.

"I think what we're talking about is not just the glue of the future, but the screw of the future," Autumn said.

Aside from the obvious uses like ceiling tiles or shelves, this new way of holding things together will likely be used in safety devices, sports equipment, cell phones and even ouch-free bandages, he said.

Products based on nature can also yield environmental benefits. Dirt-resistant paint requires less frequent washing and repainting, reducing both resource use and waste. Self-sticking parts eliminate the need for toxic glues and may help make products last longer. Applying the secrets of termite mounds to human construction may, scientists and engineers hope, show us how to use less energy to keep the air inside our buildings fresh and comfortable.

Termites build and continually readjust lofty piles of dirt over their underground nests to keep the colonies perfectly ventilated, with just the right balance of oxygen, carbon dioxide and humidity.

"The thing about these termite structures is that they are organs of physiology," said J. Scott Turner, a physiologist at the State University of New York's College of Environmental Science and Forestry in Syracuse.

In other words, the structures breathe.

"This work is helping move the science of biomimicry from merely bio-inspired structures to structures that have a kind of life of their own," Turner said.

In a few decades, Turner expects that robots will be programmed to mimic termite behavior in building self-sufficient structures in arid or hostile environments.

"We hope our findings will provide clues that aid the ultimate development of new kinds of self-sufficient human habitats," said Soar, the researcher at Loughborough University. "Not only on the Earth but maybe one day on the moon and beyond."

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