

*The Exhibition of Cultural Creative Industries of Taiwan and Thailand's title may not get the creative juices flowing, but its Thai section is more than enough to keep design lovers occupied*



## Living the Thai life

BY IAN BARTHOLOMEW  
STAFF REPORTER

**Bon Chic**, Bon Craft — The Exhibition of Cultural Creative Industries of Taiwan and Thailand (勞工藝、觀時尚—台灣VS泰國文化創意產業特展), which opens Saturday at the National Taiwan Craft Research Institute (國立台灣工藝研究所) in Nantou, might sound like a somewhat dry affair. Indeed, it will have its share of seminars for industry professionals and government staffers, but it will also be enlivened by an exhibition of Thai and Taiwanese design, and on the opening day will feature a joint Thai/Taiwanese production of *Monkey Kings*, based on the shared traditions of Hanuman, the Hindu monkey god, and Sun Wukong (孫悟空), the monkey king of Chinese legend.

Design has become an integral

part of our daily lives, and most people are now familiar enough with various broad styles to recognize the minimalist lines of Nordic design, the rugged utilitarianism of German design, the playful elegance of Italian design and so on. One of the newest members of this celebrity group of design-conscious nations is Thailand.

The Land of Smiles has achieved the remarkable feat of transforming indigenous cultural elements and combining them with its long tradition of handicrafts to produce a very contemporary yet unmistakably Thai design style with an environmentally conscious bent.

The exhibition traces the development of Thailand's design industry through objects from the furnishings of a Thai royal court, cottage industry products and their transformation into

contemporary fashion, and branded items with internationally recognized labels, as well as their success in using eco-friendly materials such as rattan and bamboo. Exhibited in tandem will be examples of Taiwanese design, also ranging from items heavily influenced by tradition, to more contemporary and environmentally conscious items.

At a press event on Tuesday, institute director Lin Cheng-yi (林正儀) lauded the success of Thailand's One Tambon, One Product (a *tambon* is a government unit smaller than a province) project, which encouraged each region to develop a craft specialization to vitalize the local economy, and pointed to the achievements of Taiwan's own community empowerment projects in building a unique Taiwanese aesthetic, especially in the area of handicrafts. The exhibition covers three floors and runs until April 5 next year.

The opening night features a

production of *Monkey Kings* that brings together Thailand's Joe Louis Puppet Theater and Taiwan's own Taiyuan Puppet Theater (台原偶戲團), which has proved an energetic ambassador for Taiwanese glove puppetry through bold collaborations with international theater and puppet troupes. Both the Joe Louis Puppet Theater and Taiyuan access ancient traditions but have found ways of making them retain their appeal in the 21st century. This leveraging of tradition is at the heart of the Bon Chic, Bon Craft. *Monkey Kings* will be performed on Saturday at 7pm, in the plaza outside the National Taiwan Craft Research Institute.

Four seminars on the Thai experience of branding, marketing and economic development through design will be held on Sunday from 8am. The institute is located at 573 Chungcheng Rd, Tsaotun Township, Nantou County (南投縣草屯鎮中正路573號). For additional information, visit the institute's Web site at [www.ntcri.gov.tw](http://www.ntcri.gov.tw).



[ SCIENCE ]

## Termites' stomachs may hold the key to a clean energy future

Researchers have scooped soil near the Quabbin Reservoir in Massachusetts, visited a Russian volcano, and scoured the bottom of the sea looking for microbes that hold the key to new biofuels. Now, they are investigating deeper into the belly of termites.

The otherwise dreaded insect is a model bug bioreactor, adept at the difficult task of breaking down wood and turning it into fuel. Learning the secret of that skill could open the door to creating a new class of plant-based fuels to offset reliance on petroleum products. What scientists have learned so far, however, suggests it won't be easy to duplicate nature.

Over the past year, several studies elucidating termite innards have appeared in mainstream science journals. And last month, Japanese researchers added their own report on just how termites digest wood. A key, they said, can be found within termites' bodies like nested Russian dolls — a bacteria that lives within a microorganism that lives within the termite gut.

It's an intriguing, and complicated, symbiosis.

"We only need to look to nature to get a clear sign this is not going to have a simple solution," said Jared Leadbetter, associate professor of environmental microbiology at the California Institute

of Technology, who was not involved in the study. "With 100 million years-plus to streamline this process, you have species living within species, living within species. So we better embrace the fact this is going to have a complex answer."

In a study published last year, Leadbetter and others explored a small sample of termite gut bacteria genes, and found 1,000 involved in breaking down wood.

The new study, which focuses on one of the most voracious of the 2,600 termite species, illustrates yet more complexity. The work, published in the journal *Science*, shows how a partnership within termite guts helps explain wood digestion.

The microorganism, called *P. grassii*, breaks down cellulose, a component of wood. A bacteria that lives inside that microorganism provides nitrogen, necessary for life, but scarce in wood. Researchers have sequenced the genes of the bacteria and some of the protozoa, and are now analyzing the ones involved in digesting cellulose — in hopes of better understanding the secrets of the digestion process.

"As a team, we are aiming to find out factors useful for making a novel biofuel," author Yuichi Hongoh, of the Ecomolecular Biorecycling Science Research Team at RIKEN, a research institute in Wako, Japan, wrote in an e-mail.

*The intriguing and complicated symbiosis between the bacteria that live in termites' guts and their hosts' destructive power could unlock biofuel's full potential*

BY CAROLYN Y. JOHNSON  
NY TIMES NEWS SERVICE, BOSTON



Termite mounds, near a gas processing plant, West Australia. Scientists believe the insects may prove useful in the search for alternative energy sources.

PHOTO: BLOOMBERG

The challenge of making fuel from rigid plants, such as trees, is that they lock away energy in complex molecules.

"Cellulose is a very, very tough molecule. You can hit it with acid ... and it will just sit there," said Alexander Dilorio, director of the bioprocess center at Worcester Polytechnic Institute. He is looking at everything from termites to rotting wood in the search for ways to make cellulosic ethanol. His work is funded by California biofuels company Eden IQ.

Adding to the difficulty is that a rigid material called lignin is woven in with the cellulose. Researchers are looking for a variety of solutions to these problems — and in another scourge-turned-science moment, Pennsylvania State University researchers reported this summer that a fungus harbored in the gut of the Asian Longhorned Beetle that is ravaging Worcester's maples could help degrade lignin.

But even when promising enzymes and microbes have been identified, the work isn't straightforward.

For example, a microbe discovered in a soil sample from the Quabbin Reservoir can convert woody plant matter directly into ethanol, according to Sue Leschine, a professor of microbiology at the University of Massachusetts, Amherst. But Qteros, the company she cofounded to work on the microbe, is untangling

problems such as how to more cheaply prepare the raw materials for microbe digestion, and speed up the process.

Still, entrepreneurs are moving forward. Mascoma Corp, a cellulosic ethanol company based in Boston, announced in October that it had raised US\$49.5 million toward building a plant in Michigan.

Verenium Corp in Cambridge, Massachusetts built a demonstration plant in Louisiana and is working to extract fuel from materials like bagasse — the remnants of sugar cane. Verenium, like other companies, is interested in termite innards, but ultimately is taking a much broader approach — scanning the great microbiological diversity of the world.

"Academics want to unravel [termite digestion] so they can get down to the first principles of what makes it work," Gregory Powers, executive vice president at Verenium said. "Our feeling is that process takes a very, very long time to elucidate ... We're in a business to sell chemicals, so we can't wait for the big research breakthrough in one or five years."

But to see the biofuel problem as a matter of scientific breakthroughs is itself misleading, Leadbetter said, considering the challenges posed by logistical issues such as building plants, distribution networks, and a supply chain of biomass.