

# Stronger Than Steel

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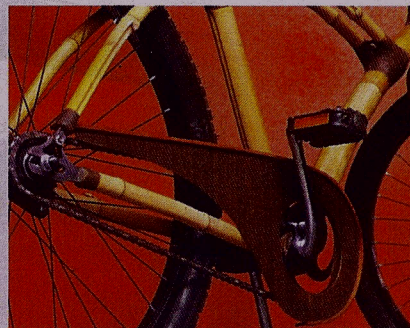
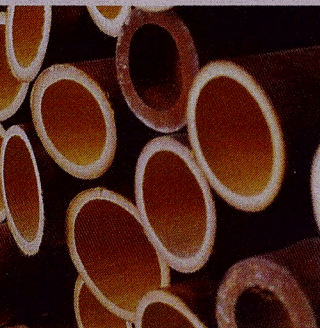
Bamboo may be the world's greenest raw material. Architects and bicycle designers are catching on.

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THE OPENING RACE OF THE Eastern U.S. collegiate cycling season, Nick Frey, a junior at Princeton, had a brand-new bike. Frey is currently the under-23 national champion and a recent Time Pro Cycling Team, had a state-of-the-art, \$13,000 carbon-fiber bike at home. What he brought to the race was drawing a steady

weight and tensile strength to bend in the wind without breaking. "Our concept of strength is, it doesn't move, it doesn't break," says Dan Smith, who owns Smith & Fong, the largest manufacturer of bamboo plywood in the United States. "The Chinese concept is, you've got to bend with things. If you don't bend, you break. Bamboo's strength is in its ability to bend, and that's the miracle."

The Western mind is also opening to bamboo's environmental qualities. In both



In his bicycle frames, Craig Calfee uses bamboo stalks that are naturally formed to balance stiffness and vibration dampening

believing collegiate cyclists on March morning—was an even model: a racing bike he and his friend made out of bamboo.

Bamboo pioneers beyond the bike industry are discovering that bamboo may be the most useful raw material ever to be used. Although a common building material in many tropical countries, it's been called "the poor man's timber," and in the West it's mainly decorative. As the world goes green, however, bamboo's uses are beginning to win recognition. Environmental organizations are beginning to use bamboo as a building material, putting it into green homes, and using it for flooring, furniture and now even setting up their industries for a revolution.

Bamboo's lowly reputation, bamboo is the strongest stuff on the planet. It has a tensile strength (or resistance to being pulled apart) than steel, and it compresses better than conventional materials. Qualities are essential to keep it standing, which grows to nearly 60 feet only as wide at the base as the trunk of a tree falling over. It needs the strength to hold up its own

weight in temperate and tropical climates, it grows as quickly and abundantly as a weed. Though most often used as an alternative to timber, bamboo, with its underground rhizome root system that continually regenerates the plant when the stalks are cut, is technically a type of grass. In fact, it

**Bamboo can grow over a meter a day and produces 35 percent more oxygen than trees.**

Bamboo grows faster than any other grass—in some conditions well over a meter a day. It also produces 35 percent more oxygen from carbon dioxide than trees and more effectively binds soil to prevent erosion.

Designers are getting more creative as they embrace bamboo as an alternative to lumber. Environmentalist architect Michael McDonough has incorporated bamboo in his two working prototypes for sustainable housing, e-House and Arc-House. E-House has all-bamboo floors

and cabinetry. A stalk of bamboo becomes a finer version of plywood once it's cut from the top and milled into strips. ArcHouse, a modular home, has an exterior made from double panels of bamboo-oriented strandboard—bamboo is compressed and cross-positioned for strength—and insulated with foam made from the oil of orange peels. The panels seal tighter than conventional insulation, and McDonough is the first to replace wood strandboard with bamboo. "It's dinosaur grass," he says, yet it's pushing the engineering curve.

Bamboo is still a niche material in the United States, but it's catching on. Smith & Fong first cracked the markets in 1989 with flooring and, later, a laminated bamboo sheet called "plyboo." Sales grew at an average of 26 percent a year until 2003, then accelerated to nearly 40 percent three

ago. The company now has 30 types of flooring and 60 options in plyboo, and has begun engineering gymnasium floors from bamboo structural beams. Bambu, a maker of housewares that are distributed by Whole Foods, has begun to draw attention at its plant and showroom in Shanghai. Bike designer Craig Calfee says it's a matter of time before bamboo sweeps the bike-racing world, and he should know. Calfee, owner of Calfee Design in California, pioneered the use of carbon fiber as a gold standard for elite bicycle frames in the 1990s. Now he says bamboo may be superior, offering a better combination of stiffness (for power efficiency) and compliance (for vibration dampening). One of his \$2,700 bamboo road frame grew just under 10 percent in 2005 but increased more than 33 percent in 2007—a trend that echoes the sales growth of Calfee's carbon frames in the late '90s.

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Bamboo  
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By LILY H

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TOUGH STUFF:

crowd of disbelieving collegiate cyclists on March morning—was an even model: a racing bike he and his friend made out of bamboo.

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