

Big bamboo

Craig Calfee noticed how tough bamboo is by watching his dog Luna chew on stalks of this tropical woody grass growing in a little grove behind his California home. The inventive owner of CarbonFrames wondered whether stalks of bamboo would work as a material for bicycle frames. If workers standing on bamboo scaffolding lashed together with rope can build some of the tallest buildings in the world, why not use this light, rigid material for bike frames?

Bamboo has been used as a bike-frame material as far back as the turn of the century, generally glued into aluminum lugs. But adhesive technology of the day was insufficient to

hold those bikes together through thick and thin, so bamboo bikes are not out on your local roads. They can still be found only in bike museums, where they amaze bike aficionados with 100-year-old technology identical to that of many present-day bonded, aluminum-lugged bike frames made with carbon, aluminum or titanium tubes. But Calfee's tube-joining technology used in CarbonFrames lends itself particularly well to bamboo construction.

Calfee built a bamboo road frame for himself seven years ago, and three years ago, he made himself a bamboo mountain frame. He could be found riding it around in Kona at the 1999 Ironman. Leaving it outside, he used the rainy conditions in Kona, interspersed with

plenty of heat and sun, to weather-test the bike. The epoxy-sealed frame has survived three years of mountain biking as well as Hawaiian weather-testing, and visions of Tony DeBoom competing in Kona on a bamboo triathlon bike dance in Calfee's head.

The major limiting factor to the production of bamboo bikes is the accessibility of large quantities of high-quality bamboo. Calfee had to first locate the highest-quality bamboo dealers in California and then pick through huge piles to

select the stalks that became his two bamboo bikes. He looks for straightness and roundness of the shaft in specific diameters. Different bamboo species offer different wall thicknesses and characteristics. For example, black bamboo is the strongest, but not suitable for bike frames because it does not grow into large enough diameter. Finding that the most common bamboo is strong enough and large enough encouraged Calfee. It grows in quarter-inch wall thickness and is quite light, due to airspaces in its vascular tissue.

As it does in its unique method of joining carbon tubes, CarbonFrames miters the bamboo tubes (with hole saws) to fish-mouth around each other, just as might be done with steel or aluminum tubes for a welded frame. Using a jig, the tubes are tacked together with epoxy adhesive. When the adhesive has cured, the frame is put in a stand, and the joints are wrapped to hold them strongly together. Wide-weave bi-directional carbon fabric is soaked in epoxy resin and wrapped around the joints while under tension. Calfee also offers an "organic" bamboo frame with joints wrapped in an epoxy-impregnated hemp fabric!

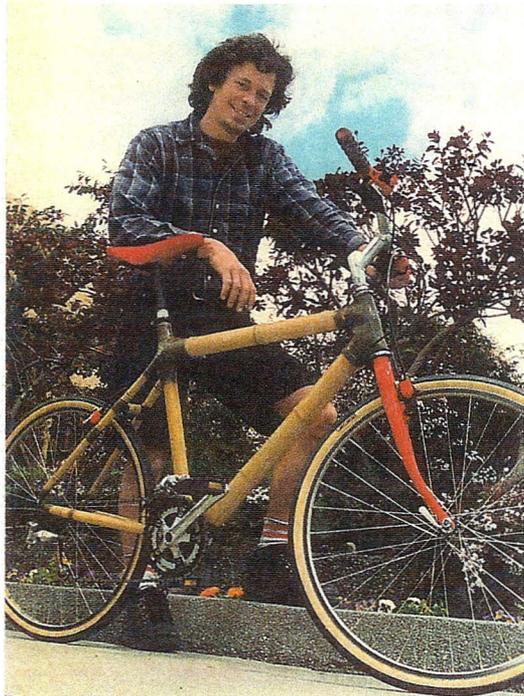
Aluminum sleeves are bonded into the bottom-bracket shell, the top of the seat tube and the ends of the head tube. Titanium dropouts are bonded to the bamboo, as are the cable guides and other frame fittings. All of this is done almost identically as would be for a CarbonFrame, although the thickness of the bamboo might just as easily allow cable guides to be screwed on rather than wrapped on. The frame is finally completely sealed in epoxy resin.

"My big challenge is finding tubing that meets my requirements," Calfee said. "I'm going to visit with a guy who makes bamboo flutes. He needs straight tubes and he machines them. I need to take a look around his shop."

"Then I wonder what kind of bike I would make. Who would pay, say, a couple of thousand dollars for a complete bike with nice components? Or maybe I should focus on the novelty aspect of it and aim at collectors and build a beach cruiser. I have enormous respect for the material."

Unfortunately for Calfee, DeBoom is unenthusiastic about experimenting with a bamboo frame at this time, when his focus is currently so firmly directed toward the Olympics. Calfee is hopeful that DeBoom does indeed race the Olympics (on a CarbonFrame) and then perhaps become relaxed enough about the Hawaii Ironman to do the race on a bamboo bike. And were he to conquer Kona on one, there may be hope for the giant pandas yet. Perhaps they could frolic in stands of their favorite food planted to supply the world's demand for bamboo bikes. **11**

CarbonFrames can be reached at 800/965-2171.



Is this the frame material of the future?

CRAIG CALFEE