

Thursday, January 22, 2004

Notions for bamboo Products:

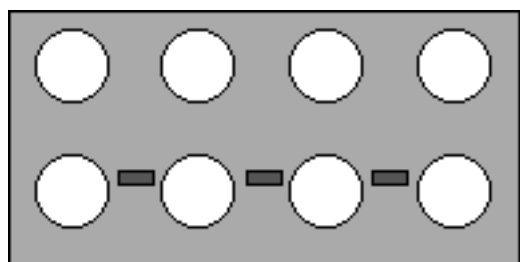
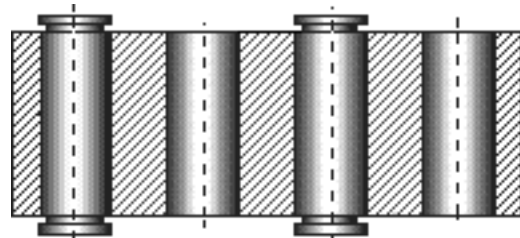
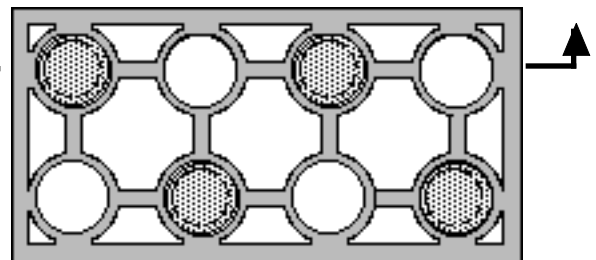
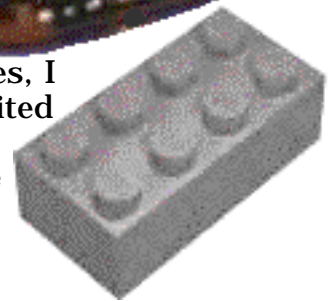
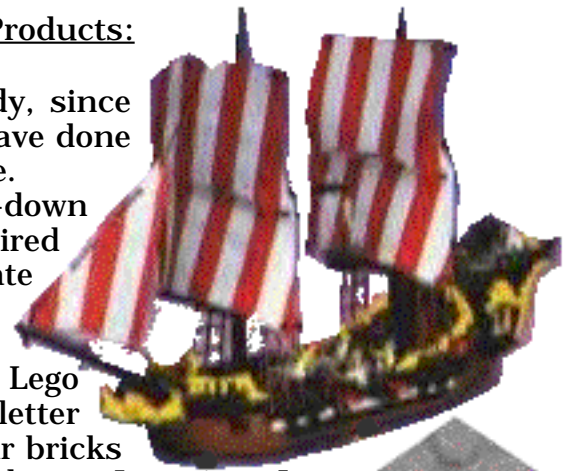
I am not trying to sell anything to anybody, since most of my notions are based on things people have done before and can be used by anyone for any purpose.

The idea for a fastener for knocked-down furniture evolved from an idea a grandson inspired eleven or twelve years ago by dropping a "pirate ship" assembled from a Lego kit. The ship exploded, as Lego toys usually do when they are dropped, and prompted me to design an improved Lego brick with a positive locking feature. I wrote a letter to give the Lego company the good news that their bricks could be improved, but instead of a delegation of happy Legovites, I received a letter to the effect that they don't review unsolicited suggestions from outside sources.

You probably know that Lego bricks are not much more than little plastic boxes with raised bumps on their bottoms. The little boxes are assembled by turning them over so the bumps are on top and pressing them down on top of one another so bumps enter boxes and force the box walls apart so that the bumps and walls are held together by the friction of interference fits. This works reasonably well when Lego bricks are used to assemble a wall, but not so well for fastening a mast to the deck of a pirate ship that will lose a few parts if it is jostled, and be completely disassembled if it is dropped.

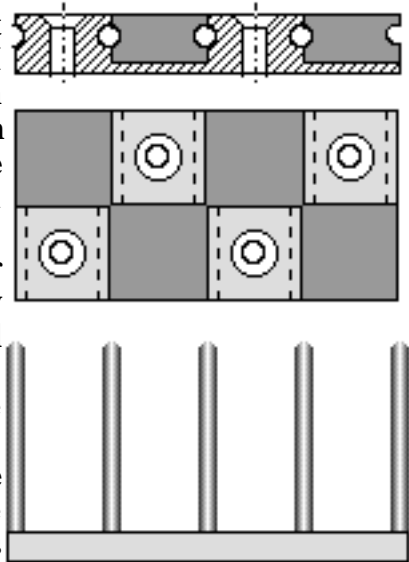
These sketches show what an "improved Lego brick" might have looked like with holes that passed all the way through it and studs with undercut ends that children could press into holes where studs were required.

The improved Lego bricks would have been assembled by placing a layer of perforated plates over a layer of bricks so studs projecting from the tops of the bricks would pass through some of the holes in the plates. A second layer of bricks would be placed over the plates so studs projecting from their bottoms passed all the way through the rest of the plate holes and entered holes in bricks under the plates. The holes would be offset toward one side of the plates, so at this time the edges of the plates would extend beyond the sides of the bricks. And as you may have guessed by now, pushing the plates into alignment with the bricks would cause the edges of the plate holes to capture the undercut studs of both layers of bricks and lock everything

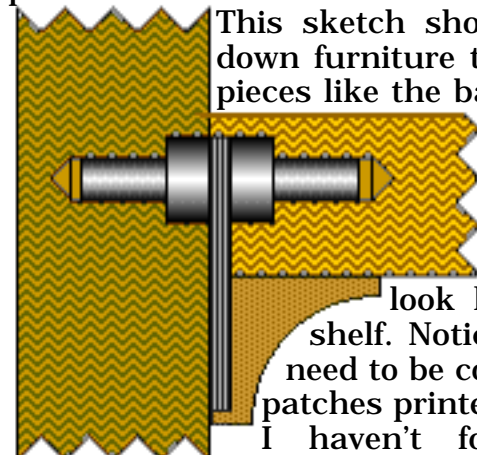
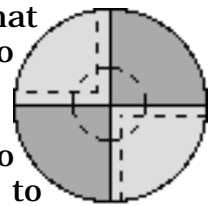


together until the plates were pushed out of alignment so the bricks and locking plates could be used again.

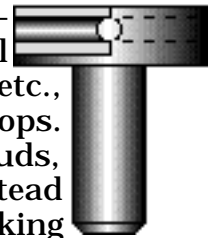
After learning that the Lego company doesn't consider unsolicited suggestions from outside sources, I designed a similar mortise and tenon fastening system with a checker board pattern of raised squares with undercut, or grooved, edges. Two raised squares would be required for an attachment surface, but four are shown in this sketch to indicate that long strips could be produced with holes for screws to attach strips to furniture or other products designed for quick assembly accomplished by placing two strips together so their raised squares meshed before inserting a locking rake so its teeth entered the grooves to lock the raised squares together. Note that the teeth would resist shear forces along their lengths, rather than across their widths or diameters, to provide exceedingly strong joints that would be limited by the strength of materials used and the attachments of strips to furniture, rather than by the design of the attachment system.



There could be other versions, as indicated in this sketch of what could be a bolt or stud with a surface similar to that of a pie with two of its four slices missing. This version could be produced by molding, casting or forging. For maximum precision, the grooves might be produced by forming grooves that would become pilot holes when two stud or bolt heads were clamped together for drilling and reaming to provide clearance or interference fit grooves for specific applications.



This sketch shows a common attachment for knocked-down furniture that requires fastening numerous vertical pieces like the backs and sides of cabinets, bookshelves, etc., to horizontal pieces like shelves and tops. The sketch indicates the use of two studs, but attachment strips could be used instead and fastened together by using a locking rake that could be designed to look like a section of molding under a shelf. Notice the absence of holes that would need to be concealed by plugs or covered over by patches printed to look like wood.

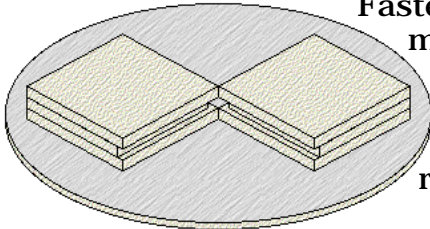
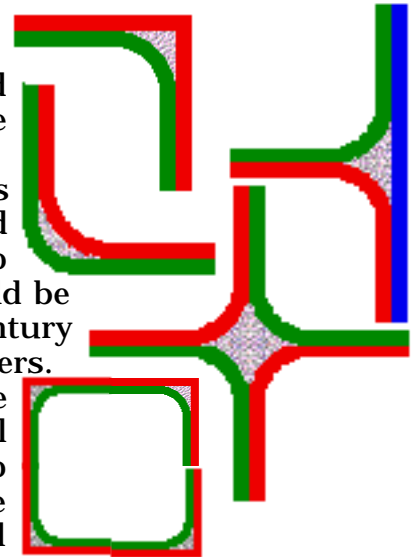


I haven't found a hardware manufacturer interested in developing metal "checker board" fasteners, but there are ways for making fastener edges as indicated by plan and end views of two-layer panels that would be attached by pushing them together so "finger" extensions from green layers would slide over the finger extensions from red layers, and be locked in place by inserting pins either individually, or collectively as the teeth of a locking rake.



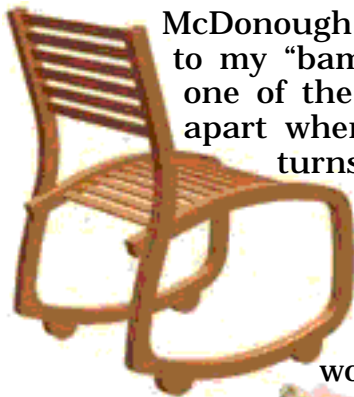
This isn't as complicated as it might seem since the same cutting pattern would be used on both green and red layers, before they were fastened together.

There could be panels with *TEE*, *ELL CROSS* and three-sided *CORNER* shapes that could be used to assemble furniture in about the same way Lego bricks are assembled. The green, red and blue colors are not intended as indications that laminated bamboo furniture should be painted, but were used to make the two layer panel construction easier for me to explain.

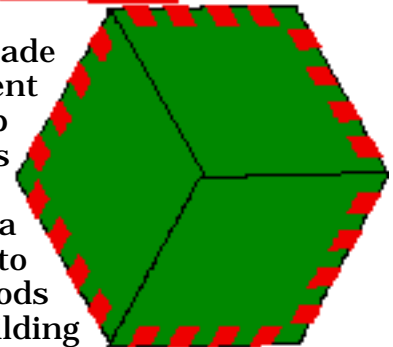


Fasteners could be made of various materials and types as indicated by this sketch of a bamboo fastener for toy boats that could be assembled to look like 19th century river boats or ocean going steamers.

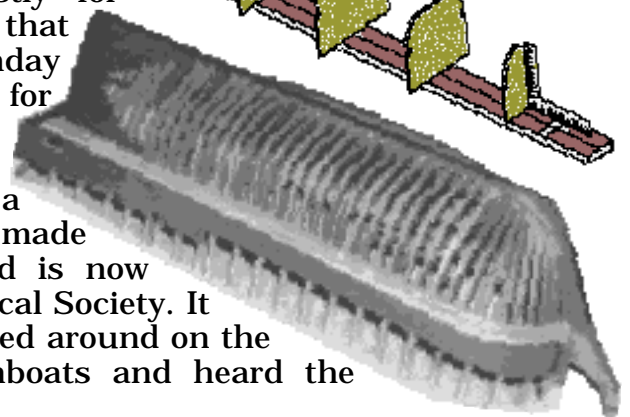
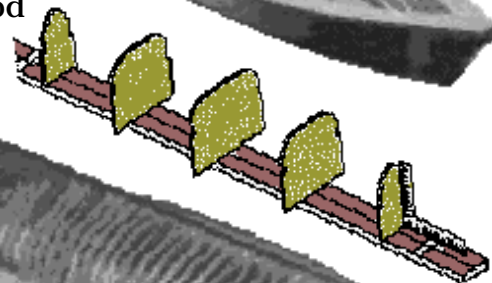
This clip shows one of the bamboo chairs that are designed and sold by Michael McDonough, an architect who has contributed to to my "bamboo education." It doesn't look like one of the traditional bamboo chairs that fall apart when the twine that ties them together turns loose. Instead, it looks like it was made by steaming wood so it could be bent into curves, just as planks for a ship replica built by a group of enthusiasts in British Columbia, were.



I have never built a model of a wooden ship so I used the Internet to discover that there are three methods that are commonly used for building hulls for model ships— a *bread-and-butter*, method, a *plank-on-bulkhead* method used in kits from Europe, and a time consuming *plank-on-frame* method that is used to build expensive and highly detailed display models.



The *bread-and-butter* method might be suitable for models made of bamboo, but would probably be used mostly for models of riverboats that looked more like birthday cakes with smokestacks for candles, than like ocean going ships and might resemble the *Excelsior*, a painted tin toy that was made during the 19th century and is now owned by the New York Historical Society. It wouldn't have floated and was probably pushed around on the floor by a child who had seen real steamboats and heard the whistles and horns of boats on nearby rivers.



The next clip shows a toy that could be used as a drop in drive for models of ships propelled by combinations of sails, oars, sweeps, paddles, propellers and paddle wheels. Paddle wheel river boats had flat bottomed hulls that didn't provide much room under their decks. So for this application, this toy could be placed over felt or rubber covered rollers on shafts that were shared with side mounted paddle wheels.

Go to plantraco.com for details of a tracked rover about ten centimeters long that has two reversible gear motors as

well as circuitry for radio control and laser tag games.

Using a toy to drive a toy may seem a bad idea, but makes sense when one considers that ship models would not have to be

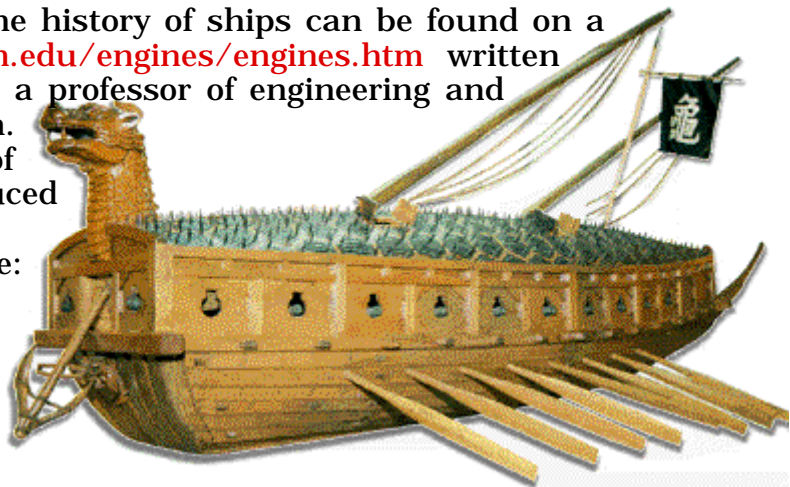
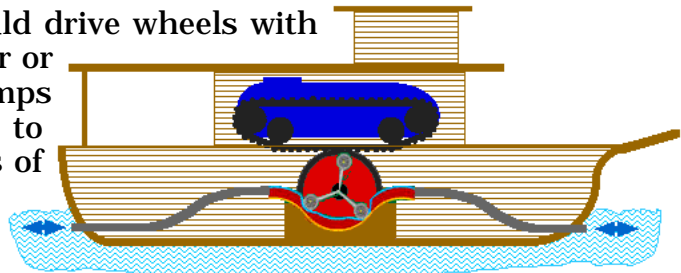
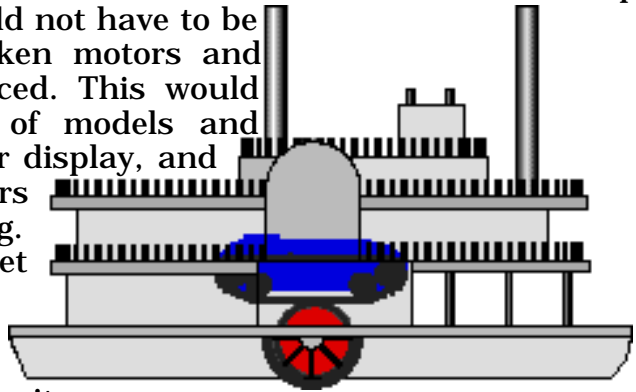
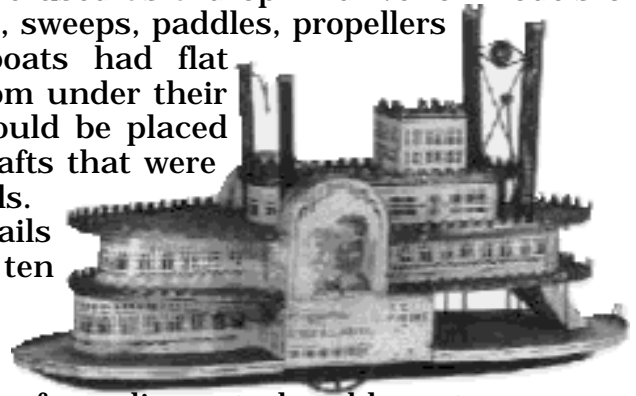
returned to get broken motors and controls fixed or replaced. This would also reduce the cost of models and

encourage collectors to buy more of them for display, and occasional use by dropping little blue rovers inside for radio controlled cruising. Organizations with web sites could get additional income by signing on as Plantraco affiliates to receive commissions for sales to people who reach Plantraco web sites by clicking on emblems on affiliated web sites.

This sketch shows how a rover could drive wheels with rollers to progressively squeeze soft rubber or plastic tubes the way that peristaltic pumps do. The soft tubes would be connected to hard tubes that extended from both sides of a boat's stern and bow to provide forward or reverse propulsion and steering in both directions.

A lot of information about the history of ships can be found on a huge web site at: <http://www.uh.edu/engines/engines.htm> written and hosted by Dr. John Lienhard, a professor of engineering and history at University of Houston. This web site has the transcript of every episode that has been produced since the show began in 1988.

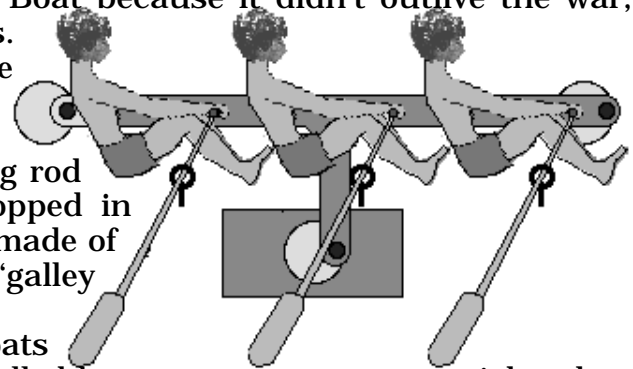
As an abbreviated example: "Today, we meet a turtle with an iron shell." When the Japanese invaded Korea in 1592, they carried muskets sold to them by the Portuguese.



They overran Seoul and were about to conquer Korea when the government turned to Admiral Sun-Shin Yi who had raised private money to build a small fleet of utterly remarkable ships called *Turtle Boats* that looked like turtles with low, rounded roofs bristling with spikes to prevent boarding during battles.

The masts folded down and twenty oars powered them during battles. Just above the oars there were ports for cannons, firearms and arrows. They had features of the Civil War ironclads *Monitor* and *Merrimac* that were built 250 years later. Turtle Boats were equipped with rams as well as dragon's heads that poured out smoke to frighten enemies and lay down smoke screens. Yi used his new weapons to devastate a Japanese fleet of 200 ships. The war ended in a truce with Korea divided politically. Admiral Yi had stopped the invasion, but had stirred up political jealousy, so political opponents had him thrown into jail until Japan renewed the invasion in 1597 and ravaged Korea's navy until Yi was exonerated and put back in charge of twelve surviving ships. A month later, he ambushed 133 Japanese ships with his tiny fleet, sank 31 and drove the rest off long enough to rebuild his navy. A year later, the Japanese began a total withdrawal of five hundred ships and Admiral Yi struck once again with his Turtles to sink more than half of them. The carnage exceeded the slaughter in Drake's defeat of the Spanish Armada ten years earlier and the Japanese were so thoroughly discouraged that they stayed away until 1904. Admiral Yi was killed in the battle— and so was the Turtle Boat because it didn't outlive the war, and isn't mentioned in Western history books.

This sketch shows a cranking frame supported by three cranks. One crank is out of line with the others to avoid the dead center problem that arises when a connecting rod is used to connect two cranks that are stopped in alignment with the rod. The rowers could be made of soft rubber and clipped to the oars as "galley slaves" of a Greek bireme.



Boats

propelled by oars were a common sight when John Fitch built the first US steam boat in 1787 and used paddles, instead of paddle wheels, to propel it. It was shown for the first time on the Delaware River to an audience of delegates from the US Constitutional Convention. Fitch received a patent on August 26, 1791, and built two steamboats with paddle wheels, after learning that his paddle driven boat didn't travel much faster

than people could walk.

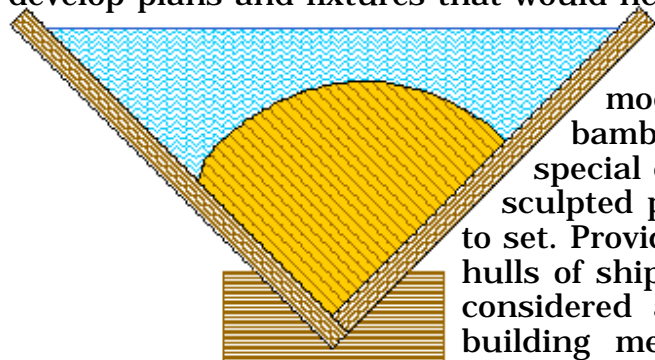
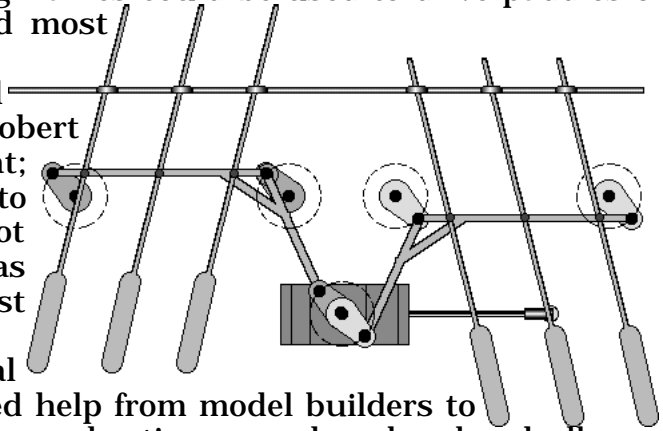
Fitch's business failed after a storm destroyed a fourth vessel that was still under construction and his financiers refused to provide him with additional funding.



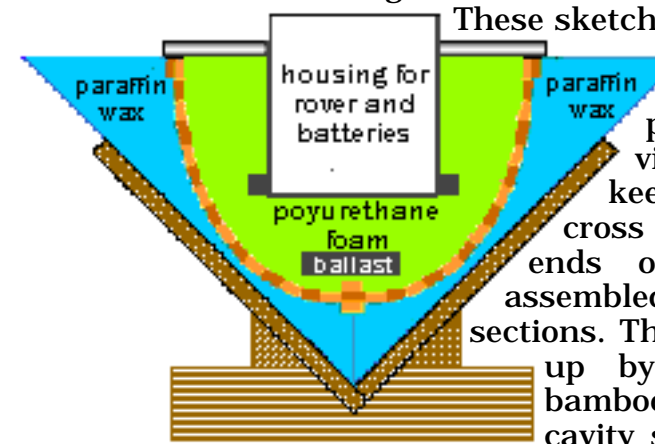
This sketch shows how two cranking frames could be used to drive paddles on each side of a model of Fitch's first, and most interesting steamboat.

Fitch is seldom mentioned by school teachers or the text books that give Robert Fulton credit for inventing the steamboat; so perhaps models could be developed to show children that steamboats were not invented by either of these men but it was Fitch, not Fulton, who built the first steamboat in the United States.

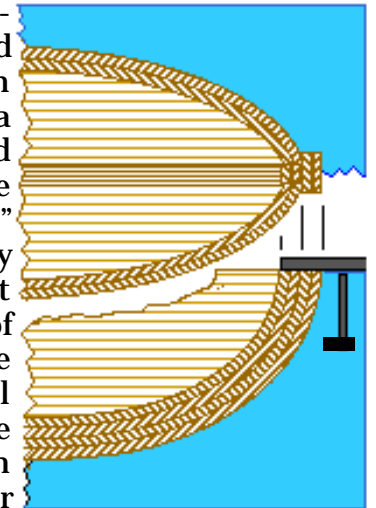
That is the sum of my nautical knowledge, so you can see that I shall need help from model builders to develop plans and fixtures that would help rural artisans produce bamboo hulls and decks of uniformly good quality.



It might be possible to do this by modifying the procedure for manufacturing bamboo surfboards which probably require special clamps to hold strips of bamboo in place on sculpted polystyrene foam cores long enough for glue to set. Providing hundreds of foam cores shaped like the hulls of ship models doesn't seem very practicable, so I considered a variation of the ancient shell first hull building method that might be facilitated by using cavities with the shapes of hulls and decks. Some hulls are widest below their deck levels, so split cavities might be required. Adhesives don't adhere strongly to paraffin, which would be relatively safe for bamboo artisans to use. Paraffin melts at a fairly low temperature, so it could be poured over wooden forms similar to half hulls that could be contained by vee-shaped wooden troughs like the one shown in this section view. Paraffin doesn't adhere to wet wood, so the wooden forms and troughs might be dipped in water and mopped off first, to make it easier to separate cavity sections from the forms and troughs after the melted paraffin had cooled and hardened.



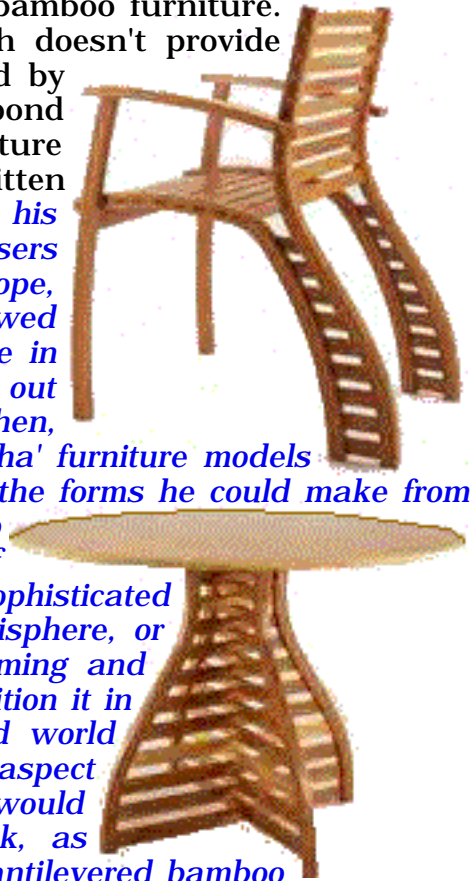
These sketches show a section view of two cavity sections held by a vee-shaped fixture and plan and section views with details of a keel with a "tee" shaped cross section to engage the ends of bamboo "planks" assembled in matching cavity sections. The keel might be built up by bending strips of bamboo for restraint by the cavity sections, or by metal stops inserted between the cavity sections.



You may have the impression that this letter is more about model boats than about furniture. some suggestions for boats could be used for furniture though and some suggestions for furniture could be used for boats.

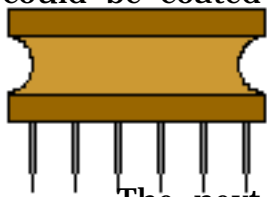
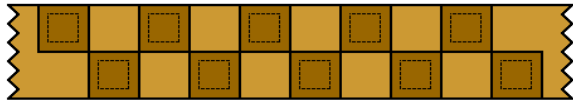
Knocked-down furniture and ship models could be produced in the areas where hundreds of people work at home weaving bamboo mats that are collected and bonded together to produce a bamboo based equivalent of plywood. Similar combinations of mechanical production and handicrafts might be used to produce bamboo furniture with handcrafted details and ship models with bamboo decks and hulls that would be equipped with metal fittings and filled with rigid urethane foam in homes equipped with equipment for doing this work.

I regret that I know very little about laminated bamboo furniture. My only source for information is the Internet which doesn't provide much, apart from the chairs and small table designed by Michael McDonough, the New York architect I correspond with occasionally. This reference to his bamboo furniture designs came from an online version of an article written about him several years ago: *McDonough continued his research with visits to bamboo growers and users worldwide. "I went to the leading bamboo nursery in Europe, the Bamboueraie, near Nîmes, France. I interviewed Charlotte Perriand, who had designed bamboo furniture in the late 1930s. I ate bamboo cuisine in Taiwan, checked out bamboo musical instruments in New York," he says. "Then, working with a craftsman in Miami, I had several 'alpha' furniture models made." As McDonough worked, he considered not only the forms he could make from bamboo, but the argument he would make for bamboo through these forms. "One of my goals was to sort of make this material an object of desire, to revalue it as a sophisticated material, and to reexport it back to the Southern Hemisphere, or back to the cultures where it's not valued." By reclaiming and innovating ways to manipulate bamboo he hoped to position it in the context of the high-tech design that the developed world knows and understands. This is where the engineering aspect of his work came in: he needed to devise structures that would exploit bamboo's strengths. This is not an easy task, as McDonough found out when he studied two prototype cantilevered bamboo chairs that Alvar Aalto had designed in 1939, before World War II put an end to the project. McDonough discovered that there had been a structural problem with Aalto's design: Aalto had used traditional concealed mortise and tenon joints to connect the pieces of the chair, "as you would if it were oak or maple or another deciduous wood," McDonough explains. "And they all cracked. Aalto was a master, and he knew wood, obviously. But bamboo is grass, not wood, and it has different properties." Drawing upon Asian joinery techniques, McDonough extended slats of laminated bamboo all the way through the frames of the table and chair. He continues to improve the design for future versions, tweaking the bends and connections, He also added a second color choice and has developed several new chairs.*

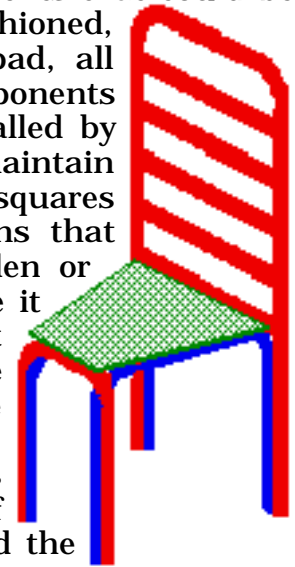


I asked Mr. McDonough for advice concerning knocked-down bamboo furniture but he suggested instead that bamboo strips could be used to make bamboo kayaks that would be beautiful and easy to market. I know very little about kayaks, other than that there are several kinds and sizes, and suspect that there are more people who buy furniture than there are who buy kayaks so I will concentrate on furniture.

This sketch shows a knocked-down chair with four components that could be made of laminated bamboo and a seat pad that might be cushioned, although this isn't indicated. With the exception of the seat pad, all attachment sites would be on the straight sections of curved components where parallel rows of raised attachment squares might be installed by

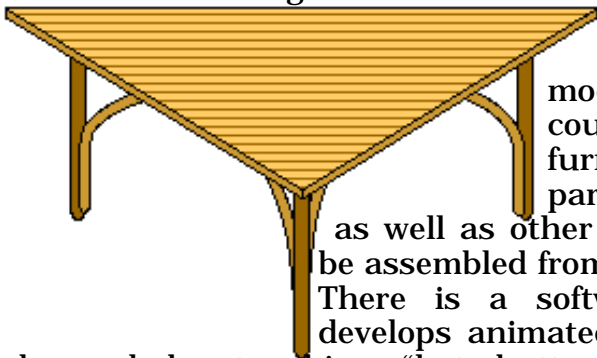


using holding fixtures to maintain the proper intervals between squares that might have integral pins that could be coated with glue and pressed or hammered into wooden or bamboo components. Colors were used to make it easier to identify individual components, not because I like painted furniture. The legs are shown closer together at the front than at the back so the chair could be nested for storage.



The next sketches show how modular boxes and panels might be assembled as cabinets, desks, bookcases, chests of drawers, armoires, kitchen cabinets and the like and reassembled the way Lego bricks can be used.

Go to a Lego web site at: <https://club.lego.com/build/brickbuilder.asp> for

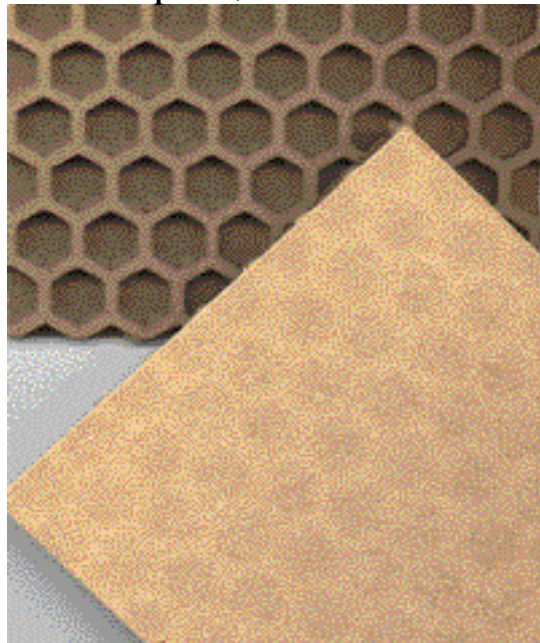
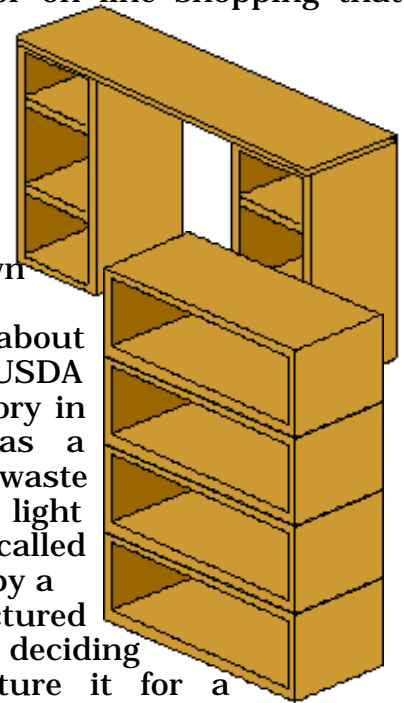


virtual Lego bricks that can be assembled in many ways. The web site provides a good model for a web site for on line shopping that could show finished furniture and lists of parts for this furniture,

as well as other furniture that could be assembled from some of the parts.

There is a software company that develops animated directions that are

advanced by touching "hot buttons" on knocked-down furniture parts, so features of this kind might be included.

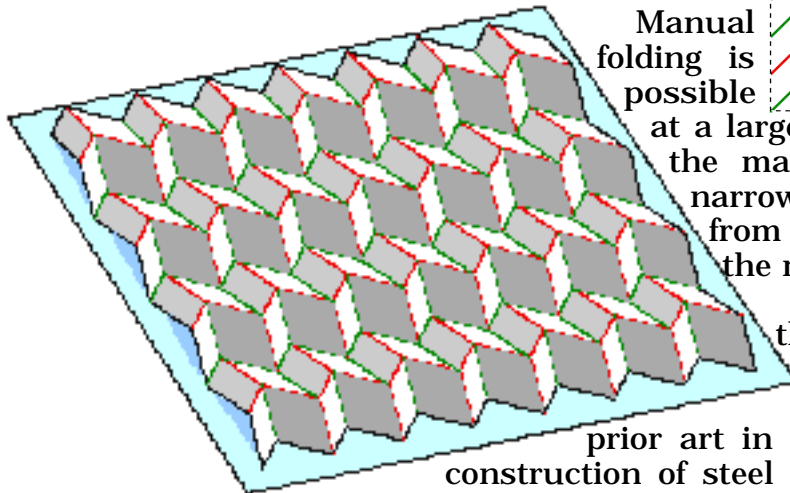
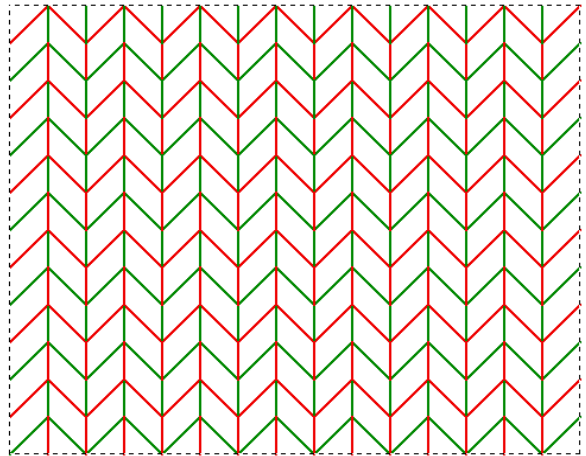


You may know about this already, but the USDA Forest Products Laboratory in Madison, Wisconsin has a process for converting waste paper and wood into a light weight sandwich panel called *Spaceboard*, or *Gridcore* by a company that manufactured it for two years before deciding they couldn't manufacture it for a competitive price.

My understanding is that they used open mold cavities to form wet pulp into mats with integral flat surfaces and raised hexagonal grids that were subsequently dried and cured in some way before gluing mats to one another to produce panels similar to honey comb sandwich panels.

I don't know why this company was unable to produce this material for a competitive price but they may have assumed that their product would become a commodity similar to plywood and oriented strand board. It didn't because it was actually more like honeycomb sandwich panels and carpenters didn't like it because their powered nail guns would blow nails through it. For Gridcore information, go to: www.pixelwindow.com/Gridcore/compny.html for licensing information, go to: <http://www.fiberfutures.org/spaceboard/> and for information about non-wood and recycled materials for manufacturing paper, panels, and furniture, go to: <http://www.fiberfutures.org/index.html>

The next sketches show a sandwich panel that could be made without obtaining a license. The first sketch shows a fold pattern for biaxially corrugated media that I suggested to a division of Continental Can Corporation that employed me about thirty years ago. The red and green lines indicate where folds are made in opposite directions. The next sketch shows what folded media might look like after it was cemented to a sheet of flat material.



Manual folding is possible

at a larger scale, but is hard to do because the material being folded becomes both narrower and shorter and has to be kept from folding in the wrong directions as the manual folding progresses.

I never gave much thought to the development of a mechanical folding method after a patent search was done, since it revealed

prior art in the form of a patent covering the construction of steel decks and platforms reinforced by steel that was folded in this way, possibly by pressing sheets of steel between a punch and die with matching shapes. Some of the manufacturers of bamboo mat board use a similar method for converting flat mats into corrugated roofing panels and could probably develop tooling to produce biaxially corrugated media that could be cemented between flat panels to make panels that could be used to manufacture knocked-down furniture.

I'm currently trying to find out whether or not bamboo strips and fibers could be combined with sulfur polymer cement in various ways. This was suggested by a pdf file titled: Mechanical and Physical Properties of Sulfur-Based Wood at: www.google.com/search?hl=en&q=sulfur+wood+composite&btnG=Google+Search that seemed to show promise in spite of the brittle nature of bonds provided by sulfur. I tried several times to find out if any follow up work might have been done using sulfur polymer cement before one of the authors of the report replied with the information that the sulfur/wood composites grew weaker as a result of exposure to moisture which generated sulfuric acid that acted on the wood fibers.

I have tried to obtain information from the two manufacturers of sulfur polymer cement that I know of in north America, the STARcrete company in the Canadian province of Alberta and the Chempruf in the US state of Tennessee. I am not a potential customer so to date. neither company has responded. I discovered that there is a fairly new manufacturer in Poland, Marbet Wil which has a web site that might interest you at: <http://www.marbetwil.com.pl/en/index.html>

I explained why I am interested in the possibility for combining sulfur polymer cement in an e-mail note to the contact person, Ms. Anna Bernacka, in late December and was told that a small test of their product with strips of bamboo would be done after the first of the year. I haven't received any recent e-mail from Ms. Bernacka so I don't know if the test has been done yet. More about sulfur polymer cement another time if you are interested. Ms. Bernacka could tell you a lot more than I can and has an e-mail address at: abernacka@marbet.com.pl One intriguing possibility is the use of an additive to convert sludge produced by burning coal with high sulfur content into something similar to sulfur polymer cement that might be used to make micro silos by a slip forming process. India isn't alone in this, because the US has a similar problem in that a considerable percentage of harvested cereal grain is wasted by the lack of on farm storage.

For information about Portland cement and bamboo composites go to: <http://www.grida.no/climate/ipcc/tectran/337.htm> for information about a bamboo guitar; <http://www.giles.com/yamaha1/pressreleases/PAC/bamboo.htm>
Bamboo musical instruments: <http://www.eriktheflutemaker.com/>
Bamboo Flooring & Molding: <http://www.bamboo-flooring.com/products.asp>
Bamboo Surfboards; <http://www.bamboosurfboards.com.au/>
A bamboo networking page: <http://www.inbar.int/chinese/networkdetail.asp>
Construction with Bamboo-Modern bamboo architecture: http://bambus.rwth-aachen.de/eng/reports/modern_architecture/referat.html
Simon Velez: <http://bambus.rwth-aachen.de/downloads/DeBoer1.pdf>
Traditional bamboo architect O. H. Lopez construction manual: http://www.bamboonursery.com/pdf_newsetup/h_11.pdf
AND some wooden model ships made by rural artisans in Vietnam: <http://www.southeastasianart.com/woodenships.html>

An online issue of INBAR news magazine has a short article about a "pack-flat" bamboo workshop sponsored in China by INBAR in April 2002. I suggested a few ideas for making this furniture easier to assemble, but haven't been informed whether they were discussed there or not. The pictures of furniture assembled at the workshop indicate that they still have a lot to learn about the design of laminated bamboo furniture if my e-mail correspondent Michael McDonough was right about the splitting problem. Bamboo mat board would probably be less susceptible because of the crossed orientation of fibers and an abundance of glue. Go to the INBAR news portal at: <http://www.inbar.int/publication/publicatnl.htm> if you would like to download the June 2002 issue that has this report.

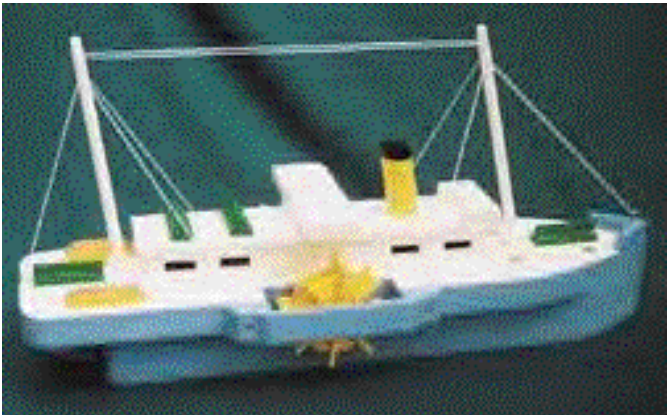
Now back to the subject of bamboo ship models, I mentioned that this would be a "Whitman Sampler" cobbled together by packaging bits and pieces from different boxes together! I also mentioned that I have joined three forum or discussion groups.

The first group was the PaddleDucks bunch where anybody who knew anything about working with bamboo didn't want to admit it to somebody who had never worked with bamboo, or made a ship model either!

The second one was the Bamboo Plantations List where I seem to have come very close to wearing out my welcome by trying to switch postings from growing bamboo to building bamboo doll houses or models of wooden ships, The list owner, Dr. Victor Brias, suggested I might find a better reception on your forum so here I am, and it does seem that I am more likely to find someone who might be interested in developing, and/or marketing bamboo models and toys here than I was before.

A lack of knowledge about ship model could be compensated for by obtaining kits and plans and using a knowledge of the differences between wood and bamboo to modify plans, or build slightly different kits. I found the "Mother of all Hobby Supply Stores" at: <http://www.hobbies-dereham.co.uk//default.htm> a few months ago and contacted them to ask if they would be interested in using bamboo in some of there products but was told that most of their products are obtained from other companies. if you visit the MOAHSS, click on "Online Shopping to find a lot of doll houses and boats that might be made at least partly from bamboo. There's a terrific kite that looks like the Wright brothers first plane. Some early planes had bamboo frames. The Wright brothers didn't use bamboo, but somebody who wants to make very strong flexible kite frames could do so.

For some neat paddle wheel models and toys click on "Search" and use "Paddle" as a search word to see a kit for a Mississippi paddle boat, a cute little boat with paddle wheels that would turn when the boat was pulled through the water on a string and a kit with a pop-pop engine that would look great in a model of the African Queen. For pop-pop info., go to <http://www.nmia.com/~vrbass/pop-pop/> to learn more than you ever knew— or wanted to know— about little tin toy



boats that were all over the place when I was a kid. A man in India still makes these things. Go to: <http://www.angelfire.com/extreme2/rattandeeperprise/> to learn about the Rattandeeperprise company. Rakesh Thukral told me he came up with this name for his company by combining the words "rattan" meaning "jewel" with "deep" meaning "lamp," hence "jewel lamp." He might be interested in providing customized pop-pop engines for use in ship models made in part from bamboo.

To see the African Queen, go to <http://naturecoast.com/hobby/billing.htm> and for pictures of ships from the Civil War era, go to: <http://tmlha.exis.net/> and scroll down, down, down. My favorite is the CSS Patrick Henry. Can you imagine how this beautiful thing would have looked and probably sounded? I think of steamboats and steam locomotives as being almost alive and resembling powerful animals: and this clip from a wash painting reminds me of a sleek black panther panting and chuffing as it creeps up on some unsuspecting animal— or the crew of a Yankee ship that went hunting for blockade runners and found more than they bargained for.

Best wishes, Frank McNeill

Frank McNeill