

Stacked Plywood

A fluid alternative to hardwood

by Ellen Swartz



Author with Surform

Making plywood furniture and understanding that process as a possible vehicle of social consciousness are primary concerns of mine. The material I use is secondary, although many people are struck by it first, foremost and finally. In 1970 I was searching for material to use in my simple shop and "found" plywood. It was easily available, inexpensive, strong when laminated, and could be worked with the basic tools I had. The more I used it, the more it appealed to me. I use it so there is very little waste (political appeal); it isn't rare or precious so my prices can reflect that (social appeal); I can scrounge plywood at construction sites for smaller works (economic appeal); and the simple and direct methods of construction allow me to concentrate more on concepts than technique (personal appeal; i.e., knowing your strong points and limitations). All said, we seem suited for each other.

The technique of making plywood by fastening thin strips of wood together and alternating the direction of the grain to give greater strength has been known since the time of the ancient Egyptians. At the Step Pyramid at Saqqara (2700 B.C.), plywood was found in which six 1/4-inch layers with alternating grain directions were fastened with wooden pegs. However, it was the demand for plywood for building ships and planes for the First and Second World Wars that brought about the product we know today. Until that time, the impermanency of casein, animal and vegetable starch glues retarded the development of plywood. The improved casein glues of the 1920s and 30s were used in airplane construction, but repeated cycles of wetting and drying caused eventual de-

terioration. The development of resin glues in 1935 made available an adhesive which is waterproof and immune to bacterial attack. It is unaffected by wet-dry cycles or intense heat and makes a permanent weld. In plywood glued with phenol resins, the glue lines are stronger than the wood. From an engineering standpoint, the advantages of plywood are impressive. It is extremely strong in comparison to its weight. It is durable, and it is permanently cured so there is no checking or splitting as with solid wood.

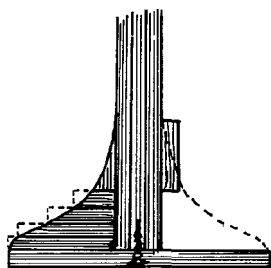
There are many ways of putting plywood together to make furniture. For the past 40 years, molded plywood has been well developed by industrial furniture designers. Veneer-covered plywood is widely used in panel and carcase construction and in cabinetmaking. But plywood can also be glued together in layers, building up to almost any form by laminating thin, cross-sectional slices. A stack of "side-view slices" can be face-glued together to block out the form of a chair that is then shaped and finished. Pieces of ply can be glued edge-to-face to make a right-angle joint, as long as the joining surface is large enough. If the area of contact is small I use screws or lag bolts for strength, as where the arms of a chair join the back. Sections can be hinged together. Laminated plywood lends itself especially to fluid, bending shapes because no joints are needed at the bends. As long as the material is thick enough for the stress it has to take, it will be extremely strong.

Plywood isn't suitable for traditional joinery, although pinned finger joints, as at the back of a chair rocker, work

High chair, coffee table, side chair: plywood's horizons open wide when the designer's mind escapes from the 4x8 sheet.



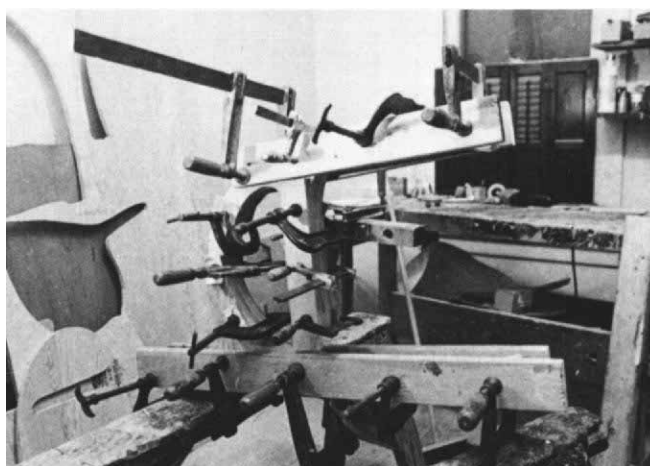
well. They need to be rather large because there are no complete long-grain to long-grain glue surfaces. I make each section three layers of plywood thick and stagger the layers to form the finger joint itself. It's very strong. To make a transition from horizontal to vertical, as in a table pedestal, I start by gluing the three vertical layers that form the column itself. Then I measure up four or five layers and glue a vertical lozenge-shaped piece to each side to form the transition, with its bottom edge square to the side of the column. I usually shape the column and the transition piece next, because there is still room to work, then I cut the base plate and screw it to the bottom of the column. Last, I cut the four or five layers that will fit between the transition piece and the base plate and glue them in place. If the measuring didn't work out and they're too thick, I plane off a layer of ply. If they're too thin, I add a piece of veneer. Then I carve away the stair steps and shape the whole base.



In terms of design, there are several ways I proceed. If an idea is quite clear, I make a small, three-dimensional and side-view sketch. Often I will ask the person I am working for whether he has any ideas to contribute, either verbally or through a drawing of his own. Other times I proceed with a rather vague idea and no sketch. This approach often evolves forms I'm sure I wouldn't ordinarily think up.

Once I determine the basic form I go directly to the plywood and draw up the first slice. This replaces the full-scale drawings many furniture makers use. The first and successive slices are cut out with a saber saw or band saw. The slices may be assembled from smaller pieces as long as the joints don't coincide from layer to layer. Usually I glue several slices at a time, sometimes as many as eight or ten. I use adjustable bar clamps and cee-clamps, placing one every 6 to 8 inches. I use Titebond yellow glue, which dries quickly, but 24 hours is still not too long to wait if much stress is going to be put on the joints.

For rough shaping I use a gouge and mallet, or a small electric chain saw. Then on larger pieces I use a high-speed sander—an auto body grinder, really—to take out the chain-



Chair begins with four side-view slices, clamped together without glue at the center.



When side has been shaped and four layers added to start the seat, gouge and Surform remove the stair-steps.

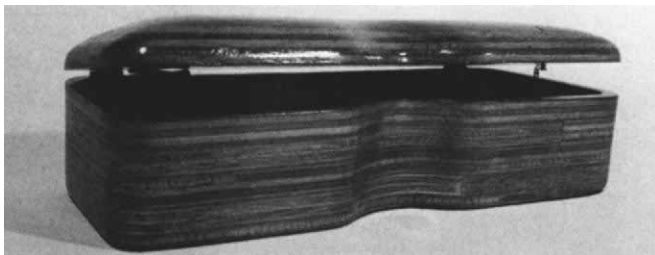
A wedge-shaped section will join the two halves, with dowels for reinforcement because the seat is supported only at the front.



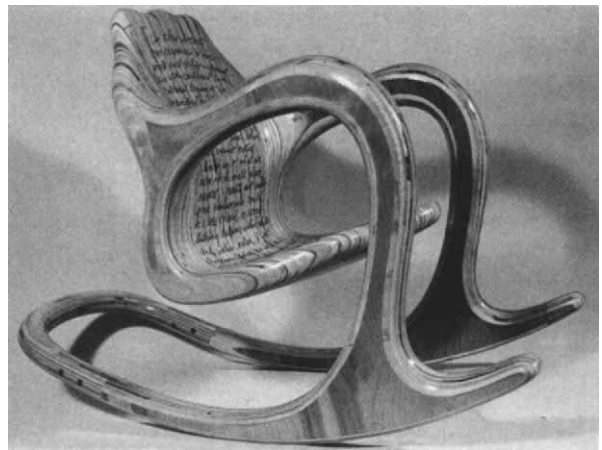
Sinuous bend of three layers of plywood is made first; it is very strong and needs no reinforcement. Two small lozenges are glued and shaped for the transition atop the base, then the bottom plate is screwed on, and the half-layers of the base itself fit in between. Similarly the tabletop, except the surface piece hides the screws into the upright section.

saw marks. But I use the Surform and rasps to give all the shapes, curves and transitions their final form. Next I file to remove Surform marks. I fill checks, voids and splits in the plywood with oak-colored plastic wood and sand. I usually start with 30 grit, then finish with 50 or 60 grit. Sometimes I sand as fine as 80, but rarely. Because of the striations, plywood doesn't have to be sanded as finely as solid wood; because plywood doesn't expand and contract like solid, the plastic wood won't fall out as long as a sealing finish is used. I generally apply six coats of urethane varnish, sanding the second and fourth coats with worn 80-grit paper. The number of coats and the sanding builds a smooth finish on the rough-sanded ply.

The major difficulty in working with plywood is the chipping out caused by working your tools across layers going in different directions. Abrasive tools are better than sharp-edged ones for most operations because they cause less chip-out. And the abrasive nature of glue lines quickly dulls a sharp edge. Otherwise laminating plywood is a direct and easy method and a lot of technical background is not necessary before beginning.



Jewelry box is made of scrap. Cantilevered seat design of finished chair pushes material to its limits.



Rocking Chair with Message

Ellen Swartz made this rocking chair last year, when she was invited to show at a gallery of contemporary craft. Before applying the varnish, she wrote a message on the back:

In this society our responses to our work and to life in general are often conditioned by the cultural legacy of "rugged individualism," i.e. competitiveness. As a basic cultural tenet, competitiveness pits people against people and people against nature. A reordering of what we value which would place respect, equality and unity above divisiveness, could be a step toward re-establishing balance within society and within nature. I feel craftsmen/artists, as well as social thinkers, philosophers and doers, have a responsibility of evaluating their work and its relationship to the social, political and economic needs of society. If we remain on our ascribed pedestals and only feel we need to relate to the world of aesthetics, we remain part of the problem, not part of the solution.

Many viewers stopped cold, wondering why she had ruined the piece by writing all over it. But several inquired about the chair, and an art teacher eventually bought it—as much for the sentiment as for the chair itself. Swartz usually writes on the furniture she makes for invitational shows, aiming the messages at the audience such shows attract. "If I'm going to enter art shows," she says, "I want those people to listen to what I say, to react to it, even to say why did she ruin it."

Swartz, 31, is no raving revolutionary, but she believes American society needs some changes. She says that in traditional societies the artisan is an integral and necessary part of the culture, making the functional things everybody needs. In industrial society, mass production makes those things, often not very well, and only the rich can afford craftsmanship. As a result, she contends, the work becomes more sophisticated, elegant and technically elaborate—but also more hollow because its esthetic is "art for art's sake."

Thus she advocates using found materials and common construction plywood as a reaction against elegant, expensive rosewood or walnut. Her shop is simple; her only machine is a band saw, although she is a trained cabinetmaker.

The point of all this is to integrate her work as a craftsman with her life in the city. Her prices reflect the same ideas. When not bartering her work, she will build on commission for the same hourly rate that the buyer earns.

"I'd like to see craftsmen consider other ways of working," she says. "I'll try to use my work for good things, not all self-gain. Sure, I'm hooked into the system too, but it's a matter of degree. It's not to reject everything wholesale; it's small re-evaluations that may lead to bigger things." —J.K.