



WOOD FORUM

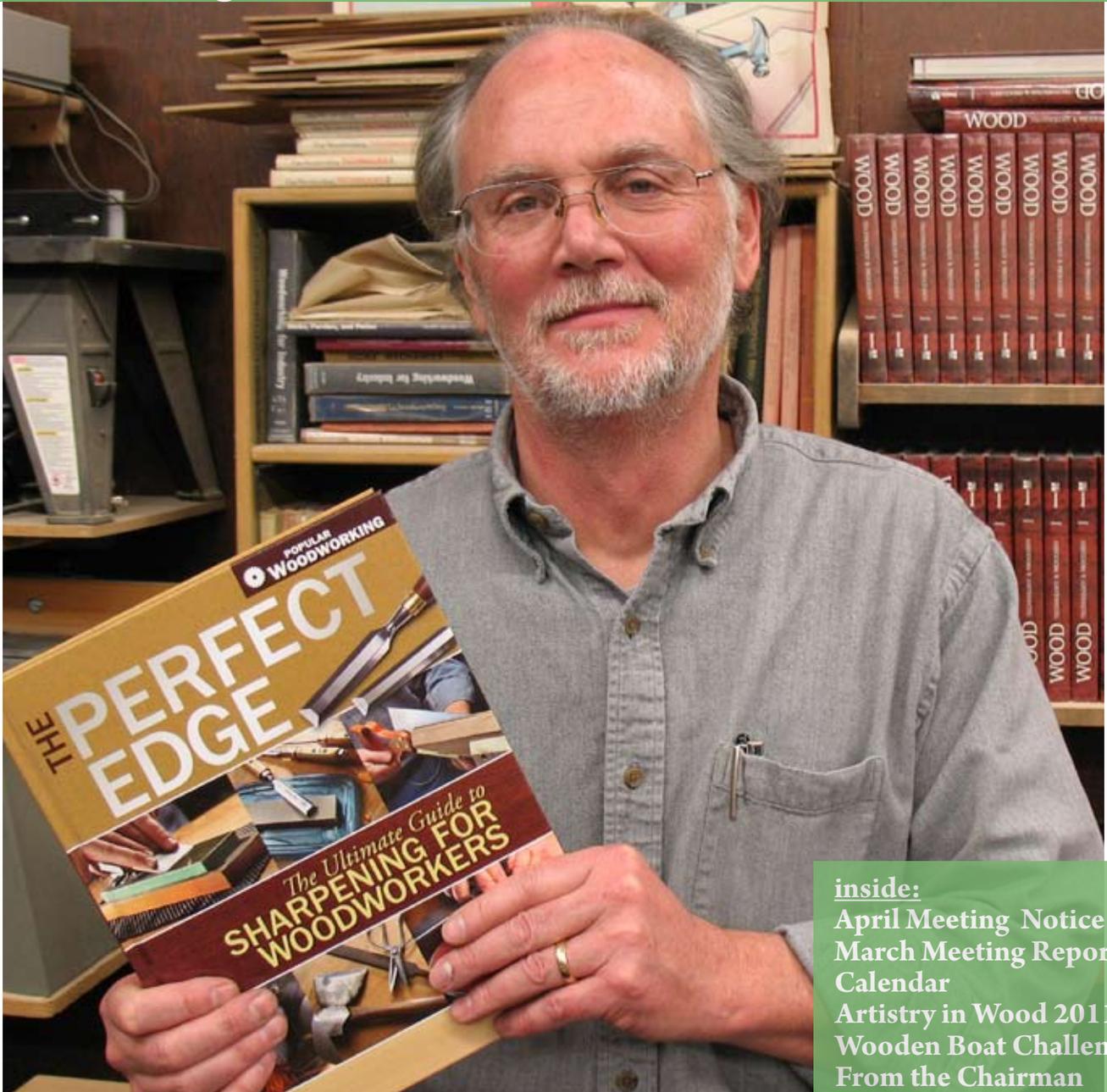
Newsletter of the Sonoma County Woodworkers Association

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April 2011

March Meeting: An Evening with Ron Hock



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From the Chairman

April Meeting - Art Hoffman

Who: Ejler Hjorth-Westh

Where: Rancho Cotate High School
5450 Snyder Lane
Rohnert Park

When: April 5th, 7:00PM

Ejler Hjorth-Westh teaches at the College of the Redwoods Fine Woodworking program in Fort Bragg. Born in Denmark, he came to the United States in 1982. In 1990, he enrolled at College of the Redwoods for a 2-year-study and joined the faculty at the Fine Woodworking Program in 2002, after the retirement of James Krenov. He has created many pieces of excellent quality, which can be viewed at several websites:

<http://www.crfinefurniture.com/ejler.html>

<http://www.whitethornconstruction.com/hardwoods/products/gallery/hjorth-westh.html>

Ejler's specialty is chairs, and they form the focus of his teaching. He has studied the problems of chair construction in depth, and will discuss this topic on the basis of some recent chairs of his design. We will meet again at Bill Hartman's Rancho Cotate High School shop.

Directions are as follows: go to Rohnert Park and head for Snyder Lane, then south if you are on Rohnert Park Expressway, or north if you are on East Cotati Avenue. Look for the school on the east side. After parking, head east, past sundry buildings, until you see the dust collector cyclone that stands above the woodshop.

Calendar

Here is the calendar for the next few months:

May 14th - Bruce Johnson, sculptor extraordinaire

June 7th - Kevin Drake

July 12th - Artistry in Wood judging night

March Meeting Report

The March meeting was held at Rancho Cotate High School in the school's woodworking shop that is under the auspices of Bill Hartman. The first order of business was to discuss various Association activities.

Bill Taft described the current progress on the Bodega boatbuilding challenge. He and Tom Segura brought in two versions of the boats that might be built for the event. One was a complete boat built by Tom, the other was a scale model. Both are similar in design with capacity for a single rower, which meets the competition requirements.

Michael Wallace gave a brief summary of the activities surrounding the annual Artistry in Wood show. Mike Burwen, our Publicity Director, has submitted a press release to all the local news outlets, including the local PBS station – KRCB in Rohnert Park – who said that they would welcome a short video that they could air announcing the show. Creating this video is now in the project plan.

The Meeting:

Ron Hock is the owner of Hock Tools, a 25-year-old cottage industry that makes superior blades for planes and other woodworking tools. Hock, once a struggling knifemaker, started the business when students from the College of the Redwoods came to him for irons for the wooden planes they were making at the school. He tooled up for plane irons, learned about plane-making and found a niche market of fussy woodworkers who appreciate a superior tool. Ron earned a BA and MFA in studio art from UC Irvine. In the ensuing quarter-century, he's learned about tool steel metallurgy, cutting-edge geometry, hand woodworking tools, and sharpening.

Ron presented a slide show that explained much concerning steel metallurgy and abrasives chemistry. The following is a brief overview of that presentation, augmented with information from his new book, *The Perfect Edge: The Ultimate Guide to Sharpening for Woodworkers* (Cincinnati, Ohio: Popular Woodworking Books, 2009).

What is steel?

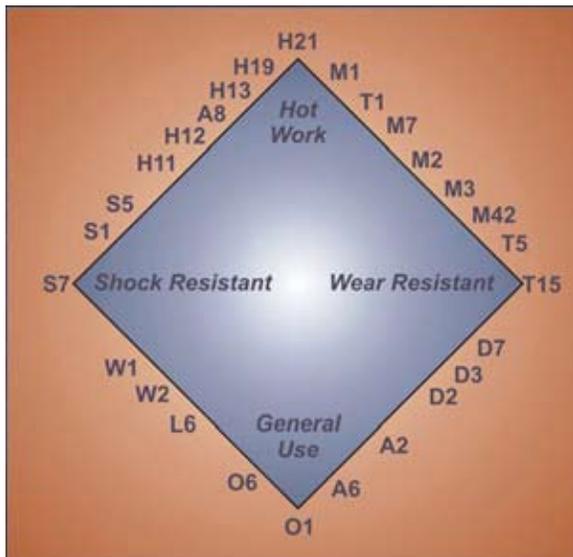
Steel is all around us. If it were to disappear overnight, we would suffer a major disaster. It not only holds up our buildings and bridges, it is a major component of the tools we use as woodworkers. Steel is an alloy of iron and carbon. The carbon content can range between 0.2% and 2% of the final mix. Anything less than 0.2% carbon is called *wrought iron*, over 2% is *cast iron*. Woodworking tool steel is greater than 0.75% carbon and is known as *high carbon steel*. The property of high-carbon steel that makes it suitable for woodworking tools is that it can be hardened.

Different Steels

Hot rolled steel is used to build battleships and bridges. Cold finished steel is used for car bodies, refrigerators, etc. Stainless steel contains 12-13% chromium to resist rusting. Chrome-vanadium steel is a high-carbon steel alloy containing 0.15-0.25% vanadium. High speed steel has a vanadium content ranging from 1%-5%. Found in applications such as axles and bicycle frames, it has often been touted to the woodworking community as a superior steel. According to Ron, it isn't worth its extra cost. Alloy steel is steel alloyed with a variety of elements in total amounts of between 1.0% and 50% by weight to improve its mechanical properties. Alloy steels are often classified by numbers such as 1095 or 4140 (both are types of aircraft steels). The numbers represent the components. There are also brand name steels such as CPM3V – a tough, wear-resistant tool steel made by a process called *carbide particle metallurgy*. It is designed to provide maximum resistance to breakage and chipping. Another example is ATS34 which is a custom knife steel from Hitachi. Finally, there are various tool steels bearing designations such as AISI, W1, O1, A2, and M4. The letter designations on the tool steels indicate how they are quenched. The quenching media are water (W), oil (O), and air (A).

Qualities of Tool Steel

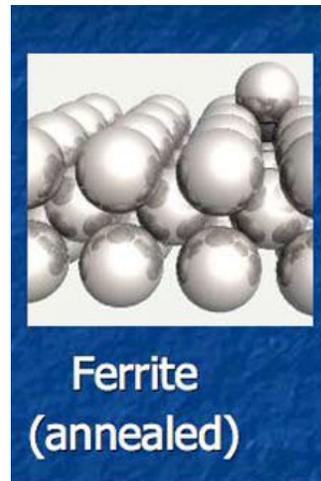
The chart below shows the properties of various tools steels. For example, W1 tool steel is a general use, shock resistant alloy, whereas A6 is more wear resistant. Ron said “no one steel can do it all. You can't have it all... everything has a tradeoff.”



Steel Crystals

As steel is heat-treated, its crystalline structure is altered.

Without any treatment, the basic structure of steel looks like that shown here:

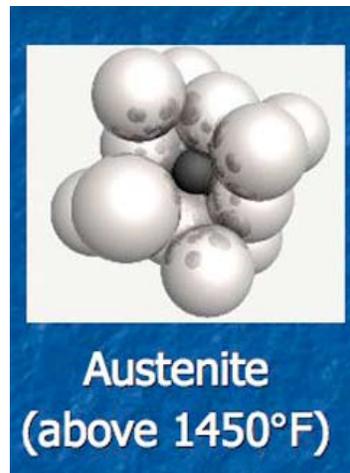


This basic steel structure is mostly ferrite. Ferrite is low carbon, magnetic, and the crystal is a body centered cubic structure.

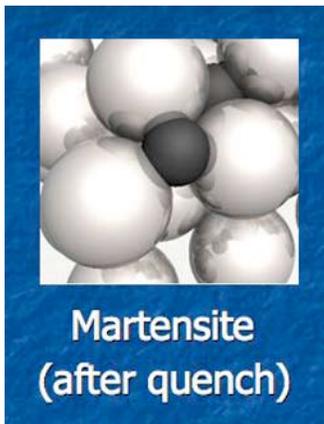
Tool hardenable steel, (remember .75% carbon?), is susceptible to “dislocation”. Dislocation means that when steel crystals are deformed (bent) and have to squeeze together, the iron atoms are forced out of formation. They are said to be dislocated. This stresses the steel, making

it likely to break. Ron gave the example of bending a coat hanger back and forth until it breaks. Metallurgists call this action “work hardening”, because, at the first deformation, the crystals are squeezed together. Bending it again forces the atoms to find spaces in the structure. It can't do that and so it breaks. Heat-treating steel inhibits dislocation and therefore, make it harder.

When steel is heated above 1450 F, its crystalline structure changes to “austenite”.



Austenite is non-magnetic and has a cubic, face-centered crystalline structure. When tool steel is heat-treated, it has reached this stage when it is no longer attracted to a magnet. Structurally, the carbon atoms reside in the hollow center of the austenite crystal. When this steel is quenched, it becomes another form of crystalline structure called martensite.



Martensite is a very hard, body-centered, tetragonal structure. It is the structure we are looking for as tool users/makers. Carbon atoms are trapped in the martensite, and it is these atoms that stress the crystals and lock the structure in a highly compressed state. Steel in the martensite state is very brittle. It needs further treatment known as “tempering”. The tempering process heats the steel

to a temperature wherein the crystalline structure is relieved of stress. “For knives, planes, irons, chisels, and such, simple high-carbon steel is tempered to approximately 325-400°F. The necessary temperature to achieve a specific hardness, based on the intended use of the steel, is a function of the exact alloy of steel being tempered.”

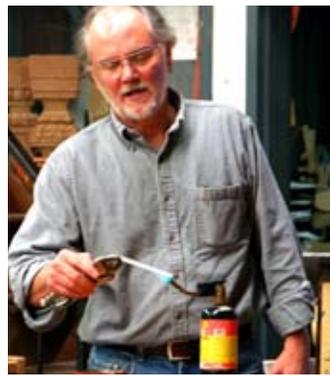
Carbides – Good and Bad

Tool steel that contains extra carbon atoms above the .75% needed to make it hardenable, will allow formation of carbides. These small, hard granules interspersed in the steel are iron atoms combined with other alloys or elements (chromium, titanium, or vanadium, etc). When various carbides are formed during heat treatment, they add wear-resistance to the steel – that’s good. Nonetheless, some carbides can grow into large particles that can interfere with honing – that’s bad. A benefit of carbide in steel is that the steels have superior wear-resistance.

A2 has 5% added chromium which turns into large carbides. If you have these lumps of carbides on the edge of your tool, it inhibits how you sharpen. If you sharpen the edge too thin, the carbides can pop out of the martensite matrix. Ron said that Lie-Nielsen used to make their A2 chisels with a 25° bevel, but too many of them were returned for edge failure because of this carbide “popping”. They now recommend a 30° bevel. It can’t be sharpened thinner, even though A2 can hold an edge for a long time.

Cryogenics

Air-hardened steel has retained austenite. Using cryogenics at -325°F, this retained austenite is converted to martensite. This cooling cycle happens over a 40-hour period and it doesn’t “use your grandmother’s freezer,” says Ron. After cooling, the steel must be re-tempered because the newly formed martensite is brittle. The cooling process forms very small carbides – eta-carbides – in the matrix which stabilize the steel. Lee Valley compared cryogenic and conventional heat-treating for their own line of tools and found no difference. For the small toolmaker, Ron believes the cryogenic treatment is worth the extra dollar.



Ron gave a demonstration of heat-treating and quenching, using a small propane torch and a can of peanut oil (“because it smells great when it smokes”). While it’s possible for the average woodworker to harden and temper steel using a small torch, as Ron did, it is difficult to hold the steel at the right temperature. Ron recommends that you use an

oven set at 325°F or a deep fat fryer, but a forge is needed to heat-treat steel wider than ½-inch. If you treat steel in the oven to 325°, Ron says that the oven method will produce a Rockwell hardness of 62, ideal for woodworking tools.

Ron heated his small steel sample to the point of becoming austenite, proving when the steel lost its ability to be attracted to a magnet. The next step was to re-heat the steel to temper the tool and then quench it in the oil. Again, tempering must be done immediately after the first heat-treatment because the steel is quite brittle at that point.

Ron emphasized the need to wear proper safety gear and to have a fire extinguisher handy during any of these processes. (Host Bill Hartman stood by his extinguisher during the demo!)

(This torch process is explained in greater detail in Ron’s book.)

Abrasives

Abrasives must be harder than the material to be abraded and sharp enough to scratch that material.

The most commonly used abrasives are:

Silicon dioxide: This is the most abundant mineral in the earth’s crust and is the major constituent of sand, flint, quartz and chert. Woodworking abrasives are a form of silicon dioxide known as novaculite.

Silicon carbide: The grains in silicon carbide are sharper and harder than aluminum oxide. The disadvantage is that they are more fragile and friable (easily crushed). They are used primarily by the automobile industry in wet or dry sandpaper.

Aluminum oxide: The “workhorse” for woodworkers according to Ron. Most of the abrasive media we use is a form of aluminum oxide.

Diamond: The hardest material on earth, diamonds can be found abundantly in many parts of the world, and methods have been created to produce synthetic diamonds that rival the purity of natural stones.

Abrasives come in different forms, classed as:

Loose: Used for lapping, stropping and buffing. Comes in the form of powders, pastes and crayons.

Coated: Sandpaper and belts are examples. Honing film is also a coated abrasive.

Bonded: Wheels and stones. When you buy a grinding wheel, you might see a stamp such as "A60-I8-V". Each of these letters and numbers represent the wheel as having a specific abrasive grit, hardness, and bonding agent, holding it all together. Ron believes that woodworkers can ignore these classifications and just buy what works.

All this is to say, buy what you're familiar with and don't pay much attention to the coding.

Ron believes that choosing bench stones is akin to choosing a wine for dinner. It is a subjective decision. Each manufacturer and type of stone (water or oil lubricated) has a fan base. Most of us choose stones based on personal experience or someone else's recommendation. Ron encourages that if possible, you should try many different brands and to determine what you like.

No matter what stones you buy, Ron recommends that you keep them clean and flat, using a flattening stone or plate. He recommends starting out with a set of 800, 1000, and 8000 grit stones, adding others when needed.

During the break and at the end of the presentation, Ron showed some of his stones and sharpening devices. One of Ron's favorites abrasive is the 3M honing film sold through stores like Woodcraft. (Our resident sharpening expert, Don Naples, suggested that you buy these films in the 80, 15, 5, and 1 micron sizes.) Ron mounts these films on a flat surface such as plate glass. A member suggested visiting countertop shops where they might have scraps of polished granite or marble. Bring a straight edge to make sure the scrap is dead flat. Usually these places either give their cutoffs away or sell them cheaply.

During the question period, Ron was asked about knife sharpening with a steel. Ron says that, until he wrote the book, he had not sharpened his knives in the past 10 or 12 years. He uses a sharpening steel and recommends a simple, non-magnetic, non-aggressive steel. Ron had several chisel sharpening guides on display. A favorite is the small Eclipse chisel guide that is now sold by Lie-Nielsen for \$14.00. Ron says it's simple, holds the chisels at the proper angle and is inexpensive.

At the end of the meeting, attendees were able to look at Ron's collection of stones, guides and gear. Ron took questions about these items and sold some of his books.

Artistry in Wood 2011

The dates for the show are as follows:

July 8 - Acceptance of pieces

July 13 - Judging event

July 15 - Opening

August (TBD) - Artist night at the museum

September 25 - Closing

2011 Wooden Boat Challenge



We are sponsoring two teams in the 2011 Wooden Boat Challenge being held on April 30th in conjunction with the Bodega Bay Fisherman's Festival. Each team consists of two SCWA members

and two students from Rancho Cotate High School. Bill Taft is the team captain for the SCWA Wood Ducks 1 and Tom Segura is the team captain for SCWA Wood Ducks 2. The name was suggested at last month's meeting.

This is the first time that any of us have entered this type of event, and we are busy getting prepared for it. The challenge is not only to build a credible boat using a limited amount of plywood, but to build it in three hours, and then race it against the other boats in Bodega Bay.

At the January board meeting, we discussed the idea of sponsoring a team of high school wood shop students in the Challenge. The idea here is to use the boat building challenge as a learning experience for the students. It would involve helping the student team design and build a practice boat prior to the event and then supporting them during the competition. As it evolved, we decided that having the teams consist of experienced members and students would work best. Each team has two SCWA members and two student members.

The teams held their first practice sessions in the parking lot next to the Rancho Cotate High Wood Shop. During the practice sessions, each team will build a boat using the allotted materials and in accordance with the rules of the Wooden Boat Challenge. This is a new experience for most of the team members and it is evident that more practice is needed. We intend to do just that.

By the way, you don't have to be a member of a team to participate in the development of our entries in the Wooden Boat Challenge. We certainly welcome anyone that wants to take part in it, especially in the design and practice sessions. Contact me if you are interested.

—Bill Taft

From the Chairman

Ron Hock's presentation on metallurgy and the heat treatment of steels took me all of the way back to the metallurgy class that I had in college. I remember the parts about the phase changes and the effect of carbon content on the properties of steels. Ron made producing blades sound easy and straightforward. However, I get the feeling that a lot of thought and effort was involved to get to where Ron is now. Thank you Ron, we all enjoyed your presentation.

On behalf of the SCWA, I want to thank Bill Hartman for hosting our March meeting. Bill has also been our host for the first Wooden Boat Challenge Team practice held on March 12th, and has been instrumental in making the arrangements for the students on the teams.

I am looking forward to our next meeting with Ejler Hjorth-Westh. If you are planning on making or thinking about making a chair, you will enjoy this meeting.

The article on the 2010 Artistry in Wood Show, announcing the awards, is in the March-April 2011 issue of Woodworker West magazine. I received ten copies of this issue from the publisher for distribution. I sent a notice to the award winners that are mentioned in the article, and to those who have the photo of their entry shown, letting them know that these are available. If there are any copies left over, I'll have them at the April meeting.

Another reminder: Entry day for the 2011 Artistry in Wood Show is Friday, July 8th. Just around the corner! Time for everyone to get busy working on your entries.

—Bill Taft

Credits:

Editing: Michael Burwen Photos: Bob Moyer, Rick White, Michael Wallace

WOOD FORUM

Newsletter of the Sonoma County Woodworkers Association

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Join Us! The Sonoma County Woodworkers Association is a 31-year old association of over one hundred professional and amateur woodworkers who meet monthly at members' shops to share experiences, ideas, techniques, and mutual enjoyment for creating with wood. Membership entitles you to attend monthly meetings, receive Wood Forum, our monthly newsletter, attend our annual show, and apply for seminars and demonstrations. Annual dues, payable at the beginning of each calendar year, are \$25. New members joining after September 30 may, for \$35, have their membership extend through December 31 of the following year. Please consider joining the SCWA and meeting people who, like yourself, are interested in the art and business of fine woodworking. Send dues to:

PO Box 4176, Santa Rosa, CA 95402 Santa Rosa, CA 95402

Wood Forum is the monthly newsletter of the Sonoma County Woodworkers Association. Please feel free to submit articles, notices, photographs, announcements, and comments for inclusion in the publication. Advertisements are accepted with a per-entry cost of \$5 per column inch. All submissions for the April issue must be received by April 15, 2011. You may submit your entries to the editor listed below.

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April 2011

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Newsletter of the Sonoma County Woodworkers Association

WOOD FORUM

MEMBERSHIP APPLICATION

Yes, I would like to join the SCWA and meet other people who are interested in the craft, the art, and the business of fine woodworking. Here is my application. I have enclosed a check for the annual dues of \$25 that covers my subscription to Wood Forum and entitles me to attend the monthly meetings.

Send check and completed application to: Sonoma County Woodworkers Association
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