Fransçois Blanchet Harpsichord
a novice approach to guitar making

The Old Saw
The Newsletter of the Guild of New Hampshire Woodworkers

Calendar

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Harvey Best details how he restored a badly damaged antique

Georgian Oak Table Restoration

woodturning chisels you can make • zen & the art of woodworking • housed dovetails • clean rails & stiles • bevel edged bench chisels • indoor air quality • square peg in a round hole • hats off to the guild

photos by Jim Seroskie
Change is the Only Constant

Like most other things in life, the only constant in the Guild is change. This will be your second issue of The Old Saw that has increased in size from 32 to 36 pages. Just think, only a few years ago our newsletter was 8-10 pages, all black and white and occasionally had an insert with some pictures. Things have sure come a long way to today’s full color mini-magazine.

Brian Sargent has submitted his resignation as Small Meetings Coordinator citing other demands on his time and his belief that there is a need for someone with a fresh approach to have a voice in what programs are the topics for our small meetings, they were talking about why so few members volunteer and his response was a request for an explanation of – “What exactly is Sunapee?” For those of you who don’t know or aren’t really sure, what follows is an explanation.

Each year starting on the first Saturday in August and running for nine days, the League of NH Craftsmen holds its annual craft fair on the grounds of Mount Sunapee State Park at the ski area. This event draws between 20,000 and 30,000 people from all over New England and other areas of the country to view the wares being displayed and sold by the juried members of the League. During this event, the Guild staffs a 20 foot by 40 foot tent. The event is our chance to interact with the public, showcase our skills, recruit new members, and put ourselves in the public eye.

We sell raffle tickets for prizes made and donated by our members. This is our most important fund raiser for the Guild scholarship fund. Guild representatives sell the tickets, answer questions about the Guild and act as ambassadors to the public. Elsewhere in the tent, there are normally two to three lathes with members demonstrating both faceplate and spindle turning all day – each day. In other sections of the tent, carvers will be working, someone might be making a dovetailed box, a Nantucket basket might be woven or a piece of furniture could be taking shape.

The variety of skills displayed over the nine days is broad and limited only by Continued on Page 13
April 21st, 2007 – 9:30 am

April Guild Meeting

at Renaissance Strings workshop in Nottingham, NH

T

The next Guild meeting will be held on April 21st at Renaissance Strings, the workshop of Jim Robertson in Nottingham. The regular session will be from 9:30 am to 12:00 pm followed by one hour for lunch. Jim will then give his presentation from 1:00 pm to 3:00 pm. Please remember to bring your own chair and lunch.

We will have a special short demo by one of our members at 9:30 am so be sure to be there on time.

Main Presentation – Have you ever wondered how fine instruments like violins are made? If you have, then you don’t want to miss this meeting.

Jim Robertson has been a woodworker by trade for over 20 years. He started his violin making studies in 1995. Formal training began in 1999 at the Violin Craftsman Institute under Master Violin Maker Karl Roy. Jim is the assistant to Karl at the Violin Craftsmanship Institute, and dedicates the remainder of his time to making and repairing bowed instruments. In his spare time, he holds demonstrations on violin making at schools and violin camps, and fiddles with the Strathclyde and Reel Society of New Hampshire.

Renaissance Strings is located in Nottingham, NH near Rt 4 and Rt 125. It is located at 181 Stage Road, Nottingham, NH, in the big barn at the corner of Gile Road and Rt 152 (Stage Road). – Sal Morgani ■

April 14th, 2007

Small Meetings Rescheduled

Snow storm pushes back March meetings to April 14th

D

Due to the Nor’easter that hit New Hampshire March 16, the three small meetings scheduled for March 17 have been rescheduled for April 14.

These meetings will follow the same format of past year’s small meeting venue. Instead of one large meeting, there will be three meetings at different locations during the day.

The Guild’s small meeting format has met with much success. We hope you are able to take advantage of seeing other shops where the venue is focused to individual interests.

You must register as there is often limited shop space in each workshop. Just contact me at 603-483-1330 or preferably by email at BLSDesigns126@earthlink.net.

– Brian Sargent ■

Goose Bay Lumber Tour—9am to 11am
Max number of attendees is 30. The meeting will be at Goose Bay Lumber on Rt 4, Chichester, NH.
Carl and Liddia will be giving a tour of their facility, which will include the small vacuum kiln, log yard and lumber facility. Carl will demonstrate their saw mill — weather permitting. This is a chance to learn something about what happens to a tree after it is cut down and how it is processed.

Curved Side Grain Inlays—1pm to 3pm
Max number of attendees is 10. The meeting will be at John Whiteside’s home shop in Fremont, NH.
John Whiteside has been making furniture part time for the past 20 years. He is currently taking classes for guitar making and has offered to share what he has learned. John will demo how to make a jig to do curved decorative inlays and the process of making the inlays. Come and see John’s 24x32 shop that he built himself and increase your knowledge of inlay work.

How to Make a Cabriole Leg—9am to 11am
Max number of attendees is 15. The meeting will be at the Homestead School in Newmarket, NH.
Dan Faia is a graduate of the North Bennett St. School. Dan balances his time between making furniture and teaching. Dan will show how to select the wood and then lay out and cut out a cabriole leg. This is a great opportunity to learn from one of North Bennett Street’s top teachers!

From Concord
Route 4 East, to route 152 East, approximately 5 miles on the left.

From Exeter
Route 101 West to exit 7 onto route 125 North, to route 152 West, approximately 5 miles on the right.

From Manchester
Route 101 East to exit 5, go right onto route 102, take a left onto route 27. Take the next right onto route 156 to the end where it merges with route 152, then approximately 1 mile on right.

From Portsmouth
Route 4 West to route 125 South, to route 152 West, approximately 5 miles on right.

April 14th, 2007

Guild Luthiers

A new subgroup of the Guild is being formed, to be announced at the April 21 Guild meeting, with the first organizational meeting to be scheduled then. We are looking at the May time frame for the organizational meeting.

The group’s focus will be lutherie, the making of stringed instruments. There is a large community of luthiers in the area. NH Furniture Master Terry Moore has agreed to be our mentor and honorary chairman. Details of focus and organization will be worked out at the May meeting. This is open to all — beginner, amateur, and professional alike. Plus, given the nature of the group, part of each meeting will be devoted to jamming!

If you are interested, contact John Whiteside, 603-679-5443 or johninfremont@comcast.net. When you call, please have some idea of preferred meeting dates and times. ■
Table Saw Blades – Is a combination blade the best choice as a table saw blade or would dedicated rip, crosscut and solid surface blades make more sense?

Brooks Tanner replies: Combination blades that I am familiar with usually give a poor cut and are usually relegated to carpentry, not cabinet or furniture work. They do have a purpose on the construction site, and I actually have one in my Skill saw. A general-purpose blade, however, is a different matter all together. A good general-purpose blade is the #1 blade used in my shop. But additional blades should be added for specific work. The primary blades in my shop are as follows:

1. Forest 40 tooth Woodworker II, ATB (alternate tooth bevel), thin kerf. General Purpose. I use this for a majority of my solid wood cuts. Rips are clean and almost too clean for a glue joint. Little clean up is necessary for a finish edge. On cross cuts, pores are left open and are not crushed, as they should be. The negative is that feed rates are slower than a dedicated rip. But the cut is finer and time is saved in sanding.

2. Royce 80 tooth Melamine, high ATB, thin kerf. This is used for veneer covered sheet goods. High tooth count together with very pointy teeth minimize splintering and tear out of the veneer and also leaves a smooth finish cut.

3. Wood Crafter 40 tooth, ATB, 0.125 kerf. Used for solid wood cuts in thick stock (6/4 +). A thicker blade will take and dissipate more heat and also will not distort as readily under high load. This blade also has a larger gullet below the tooth for removal of a larger amount of chips.

4. CMT 24 tooth, FTG (flat tooth grind), thin kerf. Rips are faster and noise is lower than with the Woodworker II. Cut quality is acceptable, but not quite as nice as with a 40 tooth.

Good quality blades will give better performance and longer life. A cheap blade will cost time in sanding and will most likely dull faster. Cheaper blades also usually have smaller teeth which cannot be sharpened as many times.

Jon Siegel replies: No one likes changing blades. Manufacturers play on this fact, and advertise that their “combination” or “multi purpose” blades work well in every situation. Don’t believe it! Dedicated blades work best. Many woodworkers tell me they have trouble ripping thick stock, but they don’t own a rip blade. On a rip blade, every tooth is the same, perfectly flat (square) on the top, and there are a small number of teeth on the blade.

Bob LaCivita replies: I think having dedicated rip and crosscut blades is the better way to go in an idle world. I have worked in shops that use this system and the amount of time lost makes it inefficient. I use Forrest combination blades and they work well. If you have time, rip and crosscut blades is great. If not, go with a high quality combination blade.

Q Smoothing Highly Figured Wood – What is the best way to smooth highly figured wood (e.g. bird’s eye maple) to a mirror finish?

Jon Siegel replies: No one likes changing blades. Manufacturers play on this fact, and advertise that their “combination” or “multi purpose” blades work well in every situation. Don’t believe it! Dedicated blades work best. Many woodworkers tell me they have trouble ripping thick stock, but they don’t own a rip blade. On a rip blade, every tooth is the same, perfectly flat (square) on the top, and there are a small number of teeth on the blade.

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Q Sticker Stain – Can “sticker stain” which has just happened (within 24 hours) be removed? I had wet walnut touch steel overnight and had blue stain. Has the stain penetrated deeply? Could it be bleached out?

Jon Siegel replies: No one likes changing blades. Manufacturers play on this fact, and advertise that their “combination” or “multi purpose” blades work well in every situation. Don’t believe it! Dedicated blades work best. Many woodworkers tell me they have trouble ripping thick stock, but they don’t own a rip blade. On a rip blade, every tooth is the same, perfectly flat (square) on the top, and there are a small number of teeth on the blade.

Bob LaCivita replies: Sticker stain is the result of acids and minerals leaching out of wood sticks (stickers) placed between layers of drying wood before drying or while drying (air dried).

You have a stain from metal. Depending on how deep it penetrated. You can sand, scrape or plane it out. If the board is not to thickness, you can run it through a planer. I would avoid bleaching because you might end up with a bigger problem. I would sand it with 220.
Have you ever read a really good book where you look up and wonder where the last hour went? The same can happen in your woodworking. It never used to happen to me but it’s starting to. It’s related to being too goal oriented. As they say in other walks, enjoy the journey, don’t worry about the destination. And in woodworking, I believe that the secret is to enjoy every step. Do each step like it is the most important one in the project. Be almost afraid to be finished.

On a slow day at a trade show years ago, I picked up a book at the a local college bookstore called Drawing on the Right Side of the Brain. I was learning to draw then and I had heard the book mentioned many times. The concept is that the brain has two functioning sections. The left half is organized, methodical and time keeping. The right half is abstract, creative, not disposed to structure.

The concept further states that when you are in that loss of time mode, you are using the right half. And if you can call on the right half more on demand, you can achieve more focus, more inner peace. Jumping to the end of the story, I’m here to tell you, against all opponents, that it is absolutely true.

I started to read this book and the exercises they take you through are simple but you are guided in a way that encourages you to do the exercise well, not quickly. About half way through the book a few days later, I realized that I was losing that sense of time while doing those exercises.

Recently, I committed to a project that stretched my skills. The nature of the project required it to be as perfect as possible and it caused me to focus like I never had before. And this project put me in that frame of mind for several reasons. I did not want to make a mistake that would ruin a piece of wood. Everything was grain matched and to fail with one part would be to go all the way back to the beginning. And the finish, color balance, presentation, no visible flaws were all critical factors. I did have a few little problems along the way and was fortunate to be able to recover them.

It was not a conscious decision to be focused. It just happened. And when I finished about two weeks later, I knew that this is what woodworking is all about. To lose yourself in a project, to lose yourself to time, to be delighted with the results. I am most proud of the finish. Too many of us skate through that phase, hating it. I loved every minute of it. That first coat is true magic. The color first comes to life. It glistens. You don’t miss a spot anywhere. And the reluctance to wipe it off ten minutes later is strong. But after I did the first wipe down, the color was still there and a smoothness-to-the-touch emerged that surprised me. I didn’t want to apply a second coat for fear of losing that smooth feel on the first coat. Six coats later, with wet sanding between, only enhanced the results. The last coat was applied like talcum powder to a baby. I decided to wipe it on so thin, so thoroughly, to rub it out even as it was still wet.

It had all the properties I could have hoped for. I can only say that time passed and I didn’t realize where it went. And the project and the finish is the best I have ever done. When I look back on this project, I find nothing that I would do differently. That’s an incredible feeling. That is woodworking!

The project took easily twice as long as was ‘necessary’. But the results are ten times better than I would have done in half the time.

And in the great balance of nature, I have subsequently tested my dovetail skills on a four little recipe boxes. I was in a hurry to see the results, and the results show it. Two are garbage. I’ll salvage them and store something in them. It will remind me each time I look at them what being in a hurry is worth. Two are better but far from acceptable.

Focus, enjoy, learn, appreciate, lose yourself in time.
Anyone can make woodturning chisels by following these instructions. In doing so, you are not trying to approximate a standard factory-made chisel. Instead, you are creating a “hard tip” tool. In many ways, this is better than a factory chisel. The cutting edge is extremely hard and durable, while the shank is tough and strong. A gouge made with a short flute is much more rigid than one with the flute running the whole length – Figure 1.

There are many approaches to making chisels in your own shop. You can use pre-hardened high speed steel (tool bit stock). This was covered in an excellent article by Bob Rosand in *American Woodturner*, Summer 2001. I do not use this type of material because it is available only in a limited number of sizes and it is expensive. Or you could use files, springs, saw blades, etc., and this is covered by John Lucas in *American Woodturner*, Spring 2001.

But in this article, I will explain how to make chisels out of high carbon tool steel, such as drill rod, which you can buy from any machine shop supplier. I prefer this type of steel, because it is consistent, easy to harden, and very low cost.

### Heat Treatment

Much mystery has been attached to heat treatment because it has a long and somewhat clouded history. The discovery of how to convert iron into steel and its heat treatment (Anatolia, 1200 BC) is what made iron superior to bronze and ushered in the Iron Age. The result of this is that today 95% of all metal products are made from iron.

Centuries ago, those early smiths did not have the advantage of micro photographs, testing apparatus, or formulas which are available to the modern metallurgist. Instead they were guided only by trial and error. Yet they were able to make astonishing tools, swords, armor, and cutlery of every description. This is because heat treatment is essentially a simple process which requires only two things...

- Control the amount of carbon in the iron thus making “steel”.
- Apply heat and cold to manipulate the crystals in the iron.

Fortunately, the first part is taken care of for us. Tool steel (which is a blended mixture of iron and carbon, plus a few other additives) is made in many varieties by steel manufacturers, and can be ordered from any machine shop or industrial supply company. “Carbon tool steel” is the direct descendant of those earliest types of steel discovered thousands of years ago.
Heat Treatment Made Easy

When the steel is heated to the red-hot temperature of 1450 degrees F, the crystal structure changes. If then allowed to cool slowly, it goes back to its original form. But if it is cooled quickly (hundreds of degrees per second), that is, quenched in liquid, it will become set into a new crystalline form and thus become hard. This process is called hardening and it works best if the steel has around 0.9% carbon.

After the hardening, the piece may be too hard and brittle to be safely used. It is possible to take away some (controlled) amount of the hardness in the second part of the heat treatment process called tempering, which is softening.

Some authors refer to the whole heat treating process as tempering, and this is confusing. Hardening and tempering are separate processes within the heat treatment.

Before hardening, the steel can be easily cut with a hack saw or machined, but after applying the heat treatment described here, carbon tool steel can attain great hardness, which, if you want to get technical, is in the 60s on the Rockwell C scale. In other words, in the fully hardened state (called Martensite) it cannot be filed, sawn, or scratched by any steel tool. It is not machinable, and can only be worked with abrasives.

One of the most amazing things about this hardening process is that it is reversible. By simply heating the steel as before (to 1450 F), but cooling it slowly, the steel is made soft again. That is the opposite of hardening, and is called annealing. Fast cooling makes it hard, and slow cooling makes it soft. This process can be reversed a number of times if necessary until eventually the carbon evaporates from the surface.

Using Known Tool Steel vs Unknown Scrap Steel

At one time, I thought it was clever to beat the system and make tools out of free pieces of high-carbon steel – springs, axles, etc. I had been influenced by Alexander Weygers, a wood sculptor who took up blacksmithing in order to make better chisels. He wrote two excellent books with lots of good information on hardening and tempering with simple equipment. They are The Making of Tools (ISBN 0-442-29360-7) and The Modern Blacksmith (ISBN 0-442-29363-1). Although woodturning chisels are different from sculpting chisels, these books are a great starting point.

However, now I purchase new tool steel to make my chisels. It didn’t take long before I realized that I had invested too much labor in the forging and grinding of the tools, only to have them fail later because of imperfections (cracks), or in the heat treatment process. I realized that compared to this labor, the cost of new tool steel is minimal.

Which Steel to Buy

Steel that is near one percent carbon and is specially formulated to be hardened is called “tool steel”.

Basic carbon tool steel comes to two varieties – a type to be quenched in water W-1, and a type to be quenched in oil O-1. The latter type O-1 is somewhat more expensive, but is less likely to crack in the quenching process. Also O-1 comes in rectangular shapes as well as round, while W-1 usually comes only in rounds (referred to as “drill rod”). W-1 is still my favorite for making turning chisels, because I make both skews and gouges from round stock, which is very inexpensive. For example, one piece of 3/8˝ drill rod (36 inches long) cost $3.15, and is long enough to make four chisels. That’s $0.79 per chisel!

Sources for Tool Steel

MSC Industrial Supply Co.
800-645-7270 www.mscdirect.com

ENCO
800-873-3626 www.use-enco.com

When you receive your tool steel, you may want to take a small piece through the hardening process just for practice and then test it to see if the hardening transformation has taken place as planned.

How can you test the hardness without a $5,000 testing machine? The most common method used by general mechanics is the file test. Simply use an ordinary file on the workpiece. If the file “bites” and scratches the steel and there are some shiny filings produced (no matter how small), then the steel is not hardened. If on the other hand, the file slides over the workpiece as if the file had no teeth, then the steel is hardened. Note that this action will ruin the file. It is best to keep a few throwaway files on hand for this test.

Shaping the Chisels

Grinding the bevel on some chisels, such as skews and scrapers is a simple operation. The only additional thing you will need to make your own chisels is a very coarse grinding wheel. You should not attempt to use the same grinding wheel for shaping the steel as you use for routine sharpening. These are distinctly different processes, and require different tools. For shaping steel, I recommend a 24 to 40 grit wheel. This will allow you to shape the point of a rough blank in a few minutes with a minimum of heat build up.

Making Gouges

Grinding the flute into a gouge is more complicated than making skews or scrapers. It requires the use of a grinding wheel with a convex radius which matches the shape of the flute.
It is easy to round the edge of a grinding wheel to any radius desired with a diamond dressing tool. Many woodworkers do not own diamond dressers because they incorrectly think they are expensive. In fact, small diamond dressing tools (¼ carat) cost only about $6. If you own a grinding wheel, then you should own a diamond dressing tool. The tool consists of a round steel rod (about 6″ long) with a diamond attached to one end.

Source for Diamond Dressers
ENCO
800-873-3626 www.use-enco.com

To use the diamond dressing tool, place it on the tool rest of your grinder and work it slowly the same way you would use a small scraper to turn wood – Figure 2.

Always use a dust mask or a collector because there will be a lot of abrasive dust produced. Be careful that only the diamond touches the grinding wheel and do not to let the wheel touch any part of the metal rod or you may grind away the metal which is holding the diamond in place – the diamond will fall off.

Wheels for Grinding Flutes
In recent years, woodworkers have discovered that white and pink aluminum oxide grinding wheels are better than the old fashioned gray wheels. They are softer, and as the surface breaks away, they continuously expose sharp grains of abrasive. Therefore they grind with less heat build up, and since they are “friable,” they are easy to shape with a dresser. I have found that the least expensive are 7″ diameter wheels designed for surface grinding machines. They are available in ¾” and ½” thickness for under $10. The only catch is that they have a hole size of 1¼”. This means that you will have to make a bushing to reduce the hole size to fit your grinder. Of course it is best to go into the machine shop and make one out of metal, but perfectly good reducers can be made out of maple.

What You Need for Making Chisels
1 Tool steel – either round rods or rectangular flat stock
2 Hack saw
3 A very coarse grinding wheel for “roughing” the shapes
4 Several thin grinding wheels
5 A diamond tool for dressing grinding wheels into round profile shape for grinding flutes
6 Propane Torch (or two) – MAPP is better
7 Magnet
8 Water
9 Motor oil
10 Chisel handle – turn your own

Procedure
1 Cut the steel to length. Use a hack saw. Allow for one or two inches to go into the handle. Lightly chamfer the cut edge on a grinder or belt.

2 Drive the steel into the handle. Nothing could be easier than fitting a round rod into a handle. If your chisel is made from flat stock however (for example a ¼” x ¾” skew chisel), you will have to make a tang on the end which fits into the handle. If you have a way to hot forge, this is the best. Another way is with a metal cutting band saw, but if you don’t have one, just grind the material away with a very coarse wheel.

3 Rough grind the point. Skews, flat chisels, parting chisels, beading tools, etc. are easy to grind. Grinding the flute in a gouge however, takes some time – Figure 3. When rough grinding the chisel at this stage, you do not have to worry about overheating because the heat treatment comes later. Follow all safety procedures for grinding wheels and always use a guard even if one is not shown in the photos.

4 Heat the steel to 1450 degrees F. You can tell when you have reached this temperature because a magnet will no longer stick to the steel. While heating the steel, touch the magnet in quick jabs. Do not let the magnet get hot or it will be ruined.

As you heat the steel, the first thing you notice is oxidizing of the surface and several colors are seen. These are the tempering colors, and are not important for now, as we pass through this temperature range (about 500 degrees F) on the way up to 1450 degrees F.

Figure 4 – Heating to the Hardening Temperature (1450 degrees F). Notice that the magnet and the quenching liquid are within inches of the torch.
At some point, you will see the metal start to glow. The temperature of the first noticeable glow (blood red) will vary depending on how bright it is where you are working. In a darkened room, it will be about 1000° degrees F, but in bright light, it could be 1200 or 1300 F. You should start checking with a magnet at this point. Do not let the temperature drop as you do the magnet test. Keep the temperature rising. The color gradually changes from dark red to cherry red – Figure 4. When the first inch or so of the chisel is glowing evenly and the magnet does not stick at all, you are ready to quench the steel.

Steel above 3/8” diameter may be difficult to reach temperature with an ordinary single propane torch – MAPP is better. Two torches working together will handle up to 1/2” thick steel. Oxyacetylene, however, is ideal for larger sizes.

5 Quench in water or oil. As you take the chisel from the flame to the quench, do it instantly so there is no time for it to cool off en route. Have the quench liquid within inches of the location where you are heating. As the chisel enters the liquid, swish it vigorously in a circle. Continue the motion until the cooling is complete – about 5 seconds. Use either water or oil according to the type of steel.

6 Draw the temper. Tempering is the reheating of the chisel this time to a much lower temperature (300° to 600° F) to remove some of the hardness and brittleness. Not all chisels need to be tempered. You will lose some hardness in the tempering. But chisels with very acute edges need to be tempered to prevent the edges from chipping. The right temperature is judged by comparing the color of the oxide coating – Figure 5.

To see the oxide coating, you must, before tempering, remove the black scale which formed in the hardening stage. Use an oilstone or some fine sandpaper until the surface is bright at least on one side.

You should stop at the first tempering color which is yellow (440 degrees F). Subsequent colors correspond to these temperatures – straw = 480, brown = 510, purple = 540, blue = 580. These represent greater degrees of softening. Tempering beyond yellow or straw will reduce the edge holding properties of the chisel, but might be necessary for some chisels such as those for mortising deep holes.

7 Finish grind. As with all carbon steel tools, do not let the steel get above the tempering color (yellow) during finish grading or the hardness will be lost. If you let the steel get to the purple or blue color, even for an instant, it is ruined, and will have to be rehardened. Therefore when you grind the tool, keep the point of the chisel cool by using light pressure, and cooling in water if necessary. If the chisel sizzles when it hits the water, it’s too hot!

I hope this article has helped to “demystify” heat treating and tool making for you. I have found there is nothing more satisfying than turning wood with chisels I made myself.

Figure 5 – Tempering Colors. The first tempering color to be seen is light straw, and this is sufficient for woodturning chisels.

Figure 6 – Drilling the Handle. After the drilling, the work is placed between centers, and the tailstock center fits the drilled hole.
The housed dovetail joint is mechanically sound, historically correct for 18th-century casework and a hallmark of fine craftsmanship. It provides an accurate means of locating drawer dividers and runners, and is quite useful when making shelves. If you can mill stock straight and square, control stock thickness, make dados and operate a router, you can make this joint. When assembling case pieces or shelves, you will have little need for glue, screws or nails.

Dados alone have little mechanical strength, but with the addition of a dovetail socket and dovetail tenon, the joint is properly aligned and quite strong. This joint allows cases to be made without face frames.

When the housed dovetail joint is used for shelving, the shelves are prevented from cupping because the shelves are held flat in the straight, shallow dados.

Much of my work replicates 18th-century case pieces such as chests and highboys. For years, I made furniture by laying out the housed dovetail joinery, carefully handsawing, then chiseling the dovetail sockets. This slow and inefficient process tested my patience enough that I began my search for a quicker, more accurate method.

I like to make the housed dovetail joint with a dado roughly ¼˝ deep. The dado is used to align and strengthen drawer runners or shelves. By housing the shoulders of runners or shelves, the joint doesn’t invite gaps like a half-blind dovetail joint, as seen in the drawing on the next page.

Searching for a Solution

As I tried out different methods, I built numerous sleds and edge guides, but my only success required the use of a sled and two matching routers – one fitted with a ¾˝ O.D. straight bit, the other with a ⅜˝-14˝ dovetail bit.

My search for a simple solution led me to milling all the dados prior to routing the dovetail sockets. But aligning the dovetail bit with the dado was not possible because a standard ¾˝ guide bushing was too deep for the ⅛˝-deep dado, and the ¾˝ dovetail bit interfered with or would shear the guide bushing. Then it occurred to me that what I really needed was a shorter guide bushing.

a super-slick trick to make a super-strong joint

Housed Dovetails

This article appeared in the Dec 2006 issue of Popular Woodworking and is reprinted with permission

Geoffrey builds 18th century period furniture and teaches at the Homestead Woodworking School
The housed dovetail is strong and forgiving.

A half-blind dovetail is much stronger mechanically than the dado.

A dado alone offers little strength and no long-grain-to-long-grain gluing surface.

Combining a dado joint with a half-blind dovetail yields a superior joint for casework. The weaknesses of both joints are eliminated.

The \( \frac{3}{4} \)" outside-diameter guide bushing must be reduced to protrude less than \( \frac{1}{8} \). This allows the base of the router to lay flat on the workpiece.

The first step is to mill all of the dados to a depth of \( \frac{1}{8} \)" with a \( \frac{3}{4} \)"-diameter straight router bit.

Use the modified guide bushing and a \( \frac{3}{8} \)" straight bit to prepare the socket for cutting the dovetail.

Use the same guide bushing and a \( \frac{3}{4} \)" dovetail bit to finish the dovetailed part of the joint.

Get a standard \( \frac{3}{4} \)" O.D. Porter-Cable router-guide bushing and reduce the protruding guide to slightly less than \( \frac{1}{8} \). You can cut the excess off with a hacksaw, and then file or grind the cut edge smooth.

Now you can set up your router with the modified guide bushing and a \( \frac{3}{4} \)"-14° dovetail bit as seen in the photo at right. The bottom edge of the dovetail bit should protrude a bit less than \( \frac{1}{2} \)" below the guide bushing for a total depth of about \( \frac{5}{8} \). Be sure your stock is thick enough to prevent routing through your workpiece. I recommend using \( \frac{13}{16} \)" or \( \frac{7}{8} \)" stock for case sides. The drawing at the top of this page shows the proportions and appearance of the finished housed dovetail.

**A Simple Formula**

To successfully make the housed dovetail joint, there are a few milling, tooling and setup requirements. The dado must be a minimum width of \( \frac{3}{4} \)" to allow a \( \frac{3}{4} \)" guide bushing to ride into the dado to create the dovetail socket. The dados should be slightly more than the depth of your modified guide bushing. The stock thickness for the drawer dividers or shelves should be the same as the width of your dados.

After milling all the dados with a \( \frac{3}{4} \)"-diameter straight router bit, set up the router with the modified \( \frac{3}{4} \)" guide bushing and a \( \frac{3}{8} \)"-diameter straight bit. Clearing out the socket with this bit will reduce the amount of material the dovetail bit will have to remove.

When you have pre-cut all the sockets, switch your router setup to the dovetail bit. Securely clamp your workpiece to your bench, lock your router bit depth, and turn on your router. The photos above show the sequence of the cuts you need to make.

The router is slid along the face of the case side, from left to right. The dovetail bit and the guide bushing locate the dado and enter the dado at the same moment. Keep the router base firmly down...
The secret to this jig is the \( \frac{1}{8} \)-thick Masonite guide piece. This matches the depth of the dado. The only adjustment needed is to move the guide piece in or out to establish the finished width of the dovetail tenon.

This clamping jig lets me quickly make the tenons without adjusting the router setup. The work is clamped vertically below the Masonite guide.

**Dovetail Tenon Clamping Jig**

I came up with this jig that uses the same \( \frac{3}{8} \) x 14" dovetail bit and router setup.

The common method used to create dovetail tenons is to mount the same dovetail bit used to rout the sockets in a router table and run the long narrow dividers vertically, twice at each end. This method is precarious and shaky at best. An alternative is a horizontally mounted router, but my method uses a simple and easy-to-make jig as shown above.

When setting up the vertical dovetailing jig, make some trial passes on scrap the same thickness.

**On to the Matching Tenon**

Of course the dovetail socket requires a matching dovetail tenon. With an easy solution to making the female part of the joint, I looked for an equally simple method to cut the dovetailed tenons on the end of the drawer divider or shelf.

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Steps to Clean Rails & Stiles

by Caleb Dietrich

There is a lot to consider when creating a cut list for the parts of frame and panel doors. Perhaps the most important is to allow extra overall width and length so they can be squared up once they are assembled. This is especially true if they are inset doors. That is, doors which are fitted to their opening – which should be perfectly square, right?. Depending on how thorough your design process was, you will also have to add the length of tenons to your shoulder measurements and do various other calculations…

• At this stage, you can also account for tear-out by adding \( \frac{3}{16} \) to the width of all your rails and stiles. Make this \( \frac{3}{16} \) if the piece will be machined on both sides as in the rails and stiles of a divided door.

• The extra width allows you to joint the parts after an initial pass through the shaper or router table. Take one pass over the jointer at \( \frac{3}{16} \) if you are working with a straight grained wood. This will clean up any tear out that may have occurred on the shaper. If you are working with a difficult wood, take two passes at \( \frac{3}{32} \).

• Once you have a straight smooth edge on all your parts, pass them through the shaper one more time for a light finish cut. This method is fast, and produces great results.

Housed Dovetails – continued

as your workpiece so that the top of the bit barely touches the top edge of the board. Move the jig top in or out to adjust the tenon thickness to match the \( \frac{3}{4} \) width of the socket.

The \( \frac{3}{8} \)-thick Masonite on the top of the jig is equal to the depth of the dado cut in the side of the case. With the base of the router on top of the Masonite, and the edge of the bushing against the edge of the Masonite, the tenons can be made without changing the router setup.

The stock used for the drawer dividers and runners should be milled to precisely the same thickness as the dados. This housed-dovetail system is based on \( \frac{3}{4} \) tooling. Consequently, the dados, dividers, runners or shelves should be uniform, flat and straight. Good stock preparation is absolutely essential for good results.

It is much safer than the dreaded climb cut and it allows you to set the fence on your shaper and leave it there. This assumes your machine can handle a full depth cut and that tear out is the only reason you would take a number of passes.

I recently put this method to the test on eight Bird’s Eye Maple doors. With sharp cutters, there was minimal clean up afterwards. This works for profiles too. I just made half a dozen 1\( \frac{1}{4} \) thick entry doors and used the same technique.

After you try this technique making doors, you’ll surely find a number of other situations in which it will be beneficial.

First pass tear-out at full depth (above) followed by jointer & light second pass clean up again at full depth (below)

African Padauk …

180 BF – All 16’ long & of very fine quality. I have one piece 28” wide, one piece 26” wide, and three pieces 12” wide. Prefer to sell all together. $2700 for all or make offer. Serious inquiries only, please.

Steve McPhee: 603-866-7091

Foley Belsaw Sharpeners …

Two sharpeners both with stands. One is set up for sharpening hand saws. The other is for circular blades. Both are \( \frac{1}{2} \) hp.

Harvey Provencher: 603-774-3331

Radial Arm Saw …

Sears radial arm saw (12”) with table and enclosed tool storage cabinet. Setup has integrated dust hood and collection by a Reliant 1hp dust collector. Price is $300 or best offer FOB Riverwoods at Exeter, NH.

Bill Fletcher: jbfletch@comcast.net

Table Saw …

10” Jet Table Saw JWTS-10JF. This saw has seen hobby use only. 4” dust port, 1.5 HP – 115/220 single phase. Currently on Amazon for $629 plus shipping or eBay for $400 min bid, local pick-up. Email me if you want pics. Asking $350.

Syd Lorandeau: slorandeau@verizon.net

Presidents Message – continued

who volunteers to work a particular day. The guild also sponsors the Best in Wood award given by the League to those items displayed in the Living With Crafts building.

I can not over-emphasize how important Sunapee is to our public image and how important the funds raised by our raffle are to our scholarship program. Our success is totally dependent on having guild members step forward and volunteer to donate prizes, demonstrate, and work as Guild representatives.

Wendy will soon be sending out a guild wide email asking for volunteers to work at Sunapee. Jim Dimick will also be emailing you to ask you to donate an item for the raffle. Try spending a day or two at Sunapee this year. You will have a great time and will also be helping out your guild. – Work safely
You never know what you will take away from a Period Furniture Group Meeting. The discussions range from design and technique to how-to-do-it.

There were eighteen members attending a recent meeting at John Whiteside’s shop in Fremont, NH. General topics included new and in-process work, a safety topic is always presented and the main topic for this meeting was a discussion about guitar making. But John added a bit of intrigue with a challenge to the Group.

A furniture restoration project was put on display for review by the members – an 1800s style side table of Georgian oak from Wales. It was a simple design of four legs supporting a single drawer with a flat oak table top. The rear left leg had been shattered in a shipping accident. Small wooden fragments were contained in a plastic bag. The three other legs were intact but their joinery was loose. The table top glue joint was cracked and both boards moved easily apart.

The owner of the table contacted the Period Furniture Group for advice on whether the table could be restored and who could provide the highest quality restoration work. After examination and discussion of the project, the members concluded that at least three options were viable.

1 Fashion a new leg and join it to leg fragments sufficient to support table for display purpose only.
2 Fabricate a new leg of similar material, color and grain to match for display purpose only.
3 Use the broken leg with the salvaged fragments and reconstruct the leg using epoxy and colorants to make the table usable for light duty and for display.

These options were complicated by the existence of some decayed wood in the apron which supports the leg joints. Decayed wood indicates the possibility that additional work may be necessary to disassemble a joint and rebuild or fortify hidden structure.

After considering the options and based on my past experience with furniture restoration, I accepted the challenge and took on the project.

Once I had the table in my own shop and had the opportunity to examine the project, I realized that this amounts to “detective work”. It means looking for evidence of what the table looked like “before”, and assembling the missing parts to resemble a finished table accurate to the time and period. I also conferred with the owner to determine the extent of the restoration and the decision to work toward “option 3” and completely restore the leg and table to as close to the original state as possible.

The leg was fractured into three major pieces. The first step was to use epoxy to join and fill the fractures. The epoxy I use is West System type 105 resin and type 206 hardener. Each metal container uses a pump dispenser to meter the exact ratio with a single stroke of each pump.

I mix small batches of the slow-set epoxy and stir thoroughly. The mix is brushed onto the fractured ends of the pieces to be joined and allowed to soak into the fibers. I then mix powdered colorant and high density filler (West #406) into the remaining mix, while stirring enough colorant to match the furniture tint.

The high density filler thickens the epoxy and creates a strong bond. This colored and thickened epoxy is then brushed over the previously “wetted” fractured ends. Clamps are applied and parts are aligned with cauls. This is where squeeze-out and excess epoxy is wiped away. Care is taken to clean exposed surfaces. More time spent
The old hide glue appeared original on the table including 45° on each end. I chiseled a matching joint. I chose a splice of straight-grained oak to closely match the existing wood grain. The splice measured approximately 3/8” square by 5” long and was chamfered 45° on each end. I filled the mortise cavity with modeling clay to prevent liquid epoxy from filling the void.

Once the vinegar had done it’s work, the joint came apart. I discovered that the joint was a double mortise and tenon that came together at the leg mortise. It was 45° mitered. The oak side apron was in perfect shape but the rear apron made of pine was seriously decayed. The tenons disintegrated as I pulled the joint apart. Corner blocks mounted on the underside of the apron were also removed with the joinery. All parts were set aside to dry for a week.

Following drying and clamping time, the leg was ready for the next step of assembly. The mortised leg fragment removed from the table apron could now be joined to the previously epoxied leg. The mortised leg fragment was 75% intact but was not strong enough without “grafting” solid wood into the joint. I chose a splice of straight-grained oak to closely match the existing wood grain. The splice measured approximately 3/8” square by 5” long and was chamfered 45° on each end. I chiseled a matching dado in the corner of the leg fragment to match the shape of the splice. The joint was epoxied with colorant and high density filler as before.

But this joint was more complex due to the ragged edges coming into alignment with the oak splice. The splice overlapped the fragile cross section of the mortise and bridged the fracture between the upper and lower parts of the leg. I filled the mortise cavity with liquid hide glue made by Titebond. The glue was a liquid hide glue made by Titebond.

After clamping and drying time, the clamps and cauls were removed and the clay was excavated from the mortise cavity. At this stage the leg was fully assembled and ready to be joined to the table. But the decayed tenons on the pine apron would not make a strong joint. I decided to make a new double tenon apron joint and join it to the existing apron. The new tenons were cut into an old dense grained, hard pine board salvaged from a previous restoration project. The tenons were shaped to a tight fit in the mortise cavity. The new “repair” apron was trimmed and dowelled into the existing apron.

I should clarify that the reason I was able to manipulate and work around the apron/leg joint was that the tabletop was loose and had broken away from the glue blocks. Apparently, the shipping damage included the cracked glue joint in the tabletop and loose joints at the three remaining leg joints. I chose to work on the worst leg first.

The leg was now re-joined to the apron and clamped in alignment with the three other legs. The glue was a thick coating of brown furniture wax. I removed the wax with a cloth soaked in mineral spirits and carefully wiped all surfaces. The white cloth became a dark brown rag. The heavy wax had concealed a hand rubbed shellac finish that appeared worn. The finish needed a light clean up. I chose a light shellac “polish.”

Using blond shellac flakes, I dissolved a one pound cut in alcohol. I took a wad of cotton and folded it into a palm-sized piece of old cotton shirt. I poured drops of alcohol on the cotton and rolled the material into a pad. Then I dipped the pad into a shallow dish of shellac and proceeded to wipe the table surface. The rapid evaporation and light padding of the surface brought up the sheen and glow of the old finish. I let the finish dry for a few days and applied a light coating of Liberon furniture wax. The wax was buffed off and the table was completed – call the customer!
Choosing a Bevel Edged Bench Chisel

In most shops, the single most used hand tools are the bevel edged bench chisels. They are the choppers of mortises, the trimmers of tenon shoulders, the wasters of excess stock, and are used for all types of cleanup work. I’m sure that you can name at least a dozen other uses. If a shop is going to have only one type of chisel, the bevel edge should be the one you choose. There are more makers and model choices available in this type than in any other form of chisel.

Most commonly, the cutting edges are ground to a 25° bevel so they have reasonable edge retention except when chopping mortises, and yet take little effort to push through the wood when paring or removing excess stock. Like everything else in life, this is a compromise angle which can perform all tasks, but is not optimized for any specific job.

In an ideal world where funds were unlimited we would all own a bevel edged set, dedicated mortise chisels, parers, firmers, cranked neck chisels, and a set or two of skews. Most of us will have to compromise, thus making our choice of a good set of bevel edged bench chisels an important one. Chisels of good quality which are well cared for should be expected to last us our lifetime.

Choosing a bench chisel requires some thought, hopefully a chance to test out various brands, and a decision about how much you are willing to spend. In this tool category, there is literally something for everyone. All chisels must meet some basic criteria for you to work effectively. The steel used must be hard enough to hold an edge without chipping or folding, and it must hold this edge for a reasonable time between sharpening.

Most chisels are between a Rockwell Rc 58 and 62. Japanese chisels, which I won’t cover here, are typically harder and run between a Rc 62–64.

The next requirement is that the back side of the chisel be flat or reasonably flat so that it can register when you want to pare, and so that when sharpening, you can get the cutting bevel and the back to meet in a straight line.

The third requirement is that the side walls of the chisel be as low as possible and that the bevel on the sides be large and deep. This allows getting into tight corners when cutting dovetails and working in other tight places.

Finally, the shape and size of the handle must allow an easy and comfortable grip. This criteria is very personal and subjective. Only testing a variety of handles sizes and styles will allow you to make a good choice.

The following survey is like my previous tool articles, oriented toward sources of supply on the internet. While local tool suppliers will carry many of these choices, using the net gives you a number of options not available in any store and quite often at very attractive prices. You can even buy from suppliers in both Europe and the UK, though shipping takes time and adds extra expense.

I have chosen, for the sake of brevity and clarity, to cover only new tools currently in production. Antique tools would themselves, double or treble the length of this short article. The opinions expressed here are my own and some folks will undoubtedly disagree with my opinions. The best advice I can give is to make every effort to try before you buy.

The quality range available today ranges from the abysmal stuff at the home center to exceptional. At the low end of the adequate scale are the Marples/Irwin Blue Chip chisels. They generally are a good value for the money and work well after a good bit of back flattening and some honing. Their primary problem is steel which doesn’t hold an edge very long before dulling. An easy fix to increase durability is to raise the bevel angle from 25° to between 27°–30°.

A step up on the scale, are the LV butt chisels and the Lee Valley bevel edged chisels. Both have harder and better steel than the Blue Chips, but still use plastic handles. They too are a good buy.

Crown chisels are generally in this low/mid quality area, but be warned that they vary greatly in quality control, steel hardness, and the flatness of the backs. I generally do not recommend them unless you are looking for some

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This project originated with my son Adam and his interest in harpsichord music of the Baroque period. In early 1984, after having assembled a French Double harpsichord from a kit and while working part time for the kit manufacturer’s representative in Manhattan, he met a person who invited him to Paris where he could further his knowledge of French harpsichords. There, he found that a harpsichord restorer owned a 1736 François Blanchet instrument, and got permission to take detailed measurements and photographs of it. He completed a plan and cross section, and made eighty pages of notes.

After returning to the US, he started to assemble materials for construction and did some harpsichord repair and restoration work. On the Blanchet, he got as far as constructing the soundboard, roughing out case pieces and jacks and preparing stock for the keyboard. For various reasons, the project stalled. Then illness resulted in his passing away in 1997.

To keep myself occupied and not let Adam’s efforts go to waste, I thought about completing the instrument. I visited Hubbard Harpsichords, kit and custom instrument builders then located in Sudbury, MA, to determine whether I could learn enough to complete the instrument. I liked what I saw and concluded that the tools and procedures they were using were within my scope of ability. We made an agreement that I would work for them a day a week in exchange for use of their equipment and set-ups. That went well, and I even improved some of the set-ups. However, I soon realized that building a harpsichord from scratch was going to take me quite a while and that I would need instruction and guidance to make a viable instrument. I then applied for and was granted a Guild scholarship to help me toward that end.

After completing the keyboard and laminating the bent-side pieces on a Hubbard form, some delays ensued. There were several turnovers of Hubbard Harpsichord’s ownership along with a move to Framingham, MA. Their technical director, Hendrik Broekman, was now running the business. I knew that he had the knowledge and construction experience to guide me. I met with him and asked for his help. He agreed to advise me how to proceed with the project and to allow use of tools and facilities as needed. Hendrik is a very talented and experienced builder and an excellent musician as well.

In the Spring of 2005, after several trips to the Hubbard shop for advice, I began assembling the case in my basement shop. The spine, cheek, tail and cross braces were made from poplar. The bent side was made of laminated basswood. The wrest plank was made from 2” thick oak which I mortised into the sides. I phoned Hendrik regularly to discuss progress and construction. I had assembled the case after several months and took the instrument to Hubbard’s to continue.

There, I used their “go-bar-deck” to glue the ribs to the underside of the soundboard and install the board into the case. The go-bar-deck has a height-adjustable 4x8 foot platform on which the items to be glued are placed. It also has a 4x8 foot plywood ceiling panel about three and a half feet above the deck. After applying glue to the pieces, downward clamping pressure is achieved by jamming strips of wood between the pieces to be glued and the ceiling panel. These strips are an inch or two longer than the space between the deck and ceiling and are approximately ¾” x 1¼” in cross section. The strips exert pressure on the pieces to be glued. This allows clamping of wide objects, quickly, and within the glue’s recommended open-time.
After installing the soundboard, the hitch pin rails and other members were glued to the case assembly. The basswood lid pieces were glued together on the go-bar-deck with bar clamps across the boards and go-bars to keep the assembly flat.

The instrument was ready for painting after sanding and sealing the case and lid pieces. An interior satin oil paint was recommended for painting the instrument. I started to apply paint after masking with blue tape and paper to protect the soundboard and other areas. Hendrik uses foam brushes, but I couldn’t manage them. I had to use bristle brushes which I could control better, but had the disadvantage of requiring tedious cleaning. The finish had to be sanded between coats, and I had a difficult time keeping it even and to a low sheen.

The summer was nearly over by now, and I decided to return the instrument to my shop where I would have more room, and possibly more control to complete the painting. I improvised a rolling table and other constructions in order to have the surface to be painted as close to horizontal as possible. After more than a month and lots of masking and painting, I finally had an acceptable finish. With the approach of cold weather and early darkness, I couldn’t do the 42 mile each way commute and waited for the next year to continue.

In May, 2006 and after a second scholarship, I took the instrument back to the Hubbard shop for stringing, completing the “jack” mechanism, and “voicing.” Because this harpsichord soundboard was made from old piano soundboards that had been removed and replaced, some of the pieces had to be scarf-joined to achieve the lengths needed. Several of these joints were noticable near the sound hole rose. Traditionally, soundboards were often decorated with paintings of flowers, animals and other designs. A professional artist, Barbara Pixton, did an elegant painting on the soundboard around the sound-hole rose concealing these joints. I was shown set-ups for punching and drilling the various parts of the “jack” mechanism that hold the plectra that pluck the strings, and made and used similar drill jigs tailored to the particular “jack” I was using.

Next, I learned how to string the instrument. Hendrik Broekman had determined the string diameters, based on their length and pitch frequency. There are 58 notes on this instrument, two strings for each note and a jack for each string. After the hitch and bridge pins were installed, I began stringing. The string diameters went from 0.009” to 0.022”. The treble end small-diameter strings are iron wire followed by yellow brass and finally red brass. Pin
There are 116 jacks – one jack per string. Each jack is made up of six parts. The body is made from Swiss pear. The tongue is made from holly and pivots on an axle. The axle is a chrome plated brass pin. The plectrum is press fitted into the tongue. The spring that returns the tongue to position after the pluck is 0.016˝ diameter mono filament. The damper fits into a slot in the top of the jack.

locations for the nut (equivalent to the bridge but located on the wrest plank) are determined by the hole spacing of the registers that guide the jacks. With all the strings in place, total calculated pull on the instrument is 1421 pounds when tuned at A415 Hz.

When a harpsichord key is depressed, it rises at the far end and lifts a “jack”, a strip of wood in which a plectrum is mounted, and plucks a string. The plectrum is made from bird quill or delrin plastic. So that the plectrum can drop below the string after a pluck and be ready for another note, it is mounted in a pivoting “tongue” located in a slot at the top of the jack. The jacks are guided in the up and down motion by wood strips called registers and a bottom guide. There are two independent registers, each with 58 rectangular holes that guide the jacks. Jacks are numbered to fit in specific holes in the registers. The plectra are cut to a bit more than 3/10˝ in length. Then they are trimmed on the underside using a scalpel to give equal or appropriate voice to the strings. I was shown how to hold the jack and scalpel to be able to trim the delrin. It was delicate work. The instrument was tuned, and as I trimmed the plectra, I would try playing a note. After weeks of work, I thought the voicing was satisfactory. But Hendrik told me that the keyboard action was too stiff and that I should trim the plectra further. After another week of voicing, we agreed that we could consider the instrument playable. Hendrik then tuned it and played some Couperin pieces. I was thrilled that it sounded so good. Hendrik said he had known it would have a good sound from what he heard when he thumped the bridge with his finger.

Now, all that was left to do was gilding the moldings and case sides. This really enhances the appearance. I had bought some gold leaf rolls and Hendrik demonstrated how to apply it. It was unnerving to apply the leaf but I got through it.

The Hubbard Harpsichords shop is about fifty stair risers up from street level in an industrial building. On the day I was to take the instrument home, I entered the stairwell at street level and heard music coming from above. Halfway up, I thought it might be Hendrik playing one of the many harpsichords in the shop for repair or refurbishing. The playing and sound were wonderful. When I entered the shop and saw that he was playing the Blanchet, I was so pleased that I grinned as I hadn’t for years. After he stopped playing, he told me that I had built a fine instrument. I thanked him for his instruction and patience with me.

There was a lot more work involved in building a harpsichord than I had estimated. When it went well and I was confident of the outcome, it was satisfying. At other times, when uncertainty slowed me down, I just kept at it. I learned a lot during the process and enjoyed the interaction with Hendrik and others. The Guild’s scholarships were a great help and also motivation to continue. Without Hendrik Broekman’s guidance, the instrument as it is, would not have been possible. I thank the Guild and Hendrik for their generosity and confidence in this project.
I describe myself as a novice with some woodworking experience. Most of my experience has been in carpentry as I did framing and roofing to put myself through my first two years of college. Although I am familiar with most machines in a wood shop, I am more comfortable building things by hand. I wanted to write this article for two reasons – one to share with everyone the tremendous pleasure a person can get from new challenges and learning new skills, and the other to encourage other novices in the Guild to not hesitate to try something new. With that said on with the article.

John Whiteside got me back into woodworking in January of last year when he got me interested in the kitchen island he was building. He encouraged me to join the Guild, which I did. About a month after we had finished the island, John mentioned that he would like to find a school and learn how to build a guitar. I told him that I would be interested in that and to let me know if he did. In early summer, joined by Paul Miller, off we went to Alan Carruth’s school in Newport, NH. Several things impressed me about the school. First and foremost was the wealth of knowledge that Alan possesses. Every class we have gotten an impromptu lecture on some aspect of guitar making. Secondly the students are friendly and always willing to share their advice and experience with you. Lastly, there are only three machines in the school – a joiner a band saw and a drill press.

**Guitars built in this school are handmade.** My first operation was to join the top, also called the sound board, of my guitar. Each top is made of two book matched pieces of wood. Alan acoustically tests each set of tops to determine what type of guitar they would be suited for. My top is made of Engleman Spruce which is a fairly soft wood. After the two pieces were run through the jointer, I hand planed them to prepare them for gluing. Hide glue is used to join the halves. The clamping system is unique. It consists of five lengths of wood about ¾” by ¾” that are about three inches longer than the top is wide. Three of these are placed on one side, top, middle, and bottom. The other two are placed on the opposite side between the three. Thick rubber bands are looped over one end of the wood, stretched over the sound board, and looped over the other end of the wood. Simple yet effective. The top is allowed to dry for two hours before the clamping is removed.

Alan’s suggestion for the back and sides was East Indian Rosewood. I did not like the dark color of this wood so I decided to look at what was available. In the end I settled on a wood from central Mexico called Palo Escrito. This wood has beautiful grain patterns and figuring but as it turns out it is difficult to work. I quickly found that you could not plane this wood as you do most woods. Planing at an angle across the grain produced tear out no matter how sharp the blade or fine the cut.

After much trial, error, and frustration, I finally found the solution. I purchased a #4 Veritas bench plane which comes with the blade having a micro-bevel of thirty-five degrees. Reading the accompanying literature, the manufacturer recommends that a twenty-degree back bevel be used for wood with a difficult grain pattern. I set up my new plane as suggested and proceeded to test it out. I was still getting some tear out but I noticed it diminished if I increased the angle I cut across the grain.

The final answer was to have a good plane with a sharp blade set at a depth that produced saw dust more than shavings and to plane at a ninety degree angle to the grain. This was a good learning experience for me that not all types of wood are worked the same. The trial and error and yes even the frustration were worth the effort. My back came out better than I could have ever hoped for. Patience and persistence does pay off.

The sides are first prepared by scrapping the exterior to remove all the tool marks. Then they were taken down to a thickness...
of 1.7 mm using a Wagner Safety Plane (more on this tool later).

A form matching the style of guitar you are building is placed in a vise. A side is then dampened with water and placed between two thin sheets of metal. Over this is placed a heat blanket and the wood begins to soften. Wooden clamps are used to hold the side to the form. The side is pressed down at the waist of the guitar first. Once this is clamped in place, the two ends are clamped down and the heat is reduced by a third and allowed to continue heating for five minutes. The heat is then turned off and once all is cooled to room temperature, the side is removed from the mold. When both sides are done they are put in an open frame shaped like your guitar and the sides are trimmed to shape. The sides are trimmed using a hollow form.

A guitar top is not flat but rather is rounded to match the arc of a 25 foot circle, thus the form is hollowed out with a 25 foot radius. This was quickly accomplished using the form as a reference and a good small block plane. For me, bending and trimming the sides has been the easiest process so far.

I then proceeded to work on the head and tail blocks that will be used to join the top and bottom of my sides. The tail block is glued in place using Titebond while the headblock is attached using two part epoxy glue. This is done for added strength. My next step will be to glue in the liners that will allow me to glue the top and back to the sides. To do this, strips of wood about three foot in length are cut and planed smooth until they reach a dimension of ¼˝x1/2˝. These are then cut every ¼˝ on the ¾˝ side leaving only ⅚” uncut. This allows the liners to follow the curve of the sides. Since this is a repetitious task, I knew that there was a way to do this fast and accurately.

I ended up building a jig for the bandsaw which not only kept a consistent depth but also allowed me to index the wood ⅛” each time. If you are new to woodworking, designing and building jigs is a skill that can make life a whole lot easier and less frustrating. It is my feeling that a jig can be built for almost every situation where repetitive tasks are required. As December ends I have my liners glued to the sides, my back needs 0.3mm of thickness removed, and I need to do at least one more test piece with my router plane before I cut the inlay for my rosette.

Building a guitar is unlike any experience in woodworking that I have ever had. Although frustrating at times, it has been a very rewarding experience so far.

I have learned several new skills and had to remember skills long dormant. Having to plane ninety degrees across the grain was a new experience for me. I mentioned that at the Guild meeting in November and one member said he had done that with burlled maple. Paul Miller told me to use paraffin wax on the bottom of my plane as it helped lessen the friction as it was pushed across the wood. He also noticed I was having problems scraping. This is because of severe arthritis in both hands. His suggestion was to pull the scraper rather than push it. Good suggestion Paul, you probably saved my guitar-making career. If you have a physical problem, there is probably a way that you can find to complete a task that will be easier for you.

On to bigger lessons. I mentioned earlier the Wagner Safety Plane which in my opinion is not all that safe. This is what the school uses to thin the sides and usually the back of the guitar. Alan showed me how to set it up, gave me a safety lecture, and then proceeded to give me a demonstration. He then told me to have at it and I almost ruined the sides of my guitar. The lesson here is just because something looks easy doesn’t mean it is. Also running some trial pieces would have been helpful. Using practice pieces is always a good idea especially if you are new to woodworking or if you are trying something new.

As luck would have it my sides were salvageable. The second time I used it, it showed me that it doesn’t always live up to it’s name as a “safety plane”. A good deep cut in my thumb proved that.

The last item concerns tool purchases. As I am just getting started, I am buying tools as I go. I had already purchased a good Rotary safety plane
block plane and realized I would also need a bench plane. Not having two to three hundred dollars to spend on a top-of-the-line plane, I came up with the following idea. I decided to purchase a GROZ plane which is a copy of the old Record. It has a decent body with a very flat sole but the blade is carbon steel.

After doing further research, I found Hock blades which are made from tool steel. Both of these items are carried by Woodcraft. A quick trip to Newington, NH and I had both of these items all for the sum of $83 (with my Guild discount of course). After running the blade over a superfine stone, I installed it in the plane and tried it out. It cut beautifully, however the weakness would show up at my next class. The blade adjustment mechanism is poorly designed and I spent more time playing with the blade adjustment than using the plane. I have since purchased a Veritas bench plane which is a work of art.

The lesson here is don’t try to skimp on tools. If you can’t afford it at the time, it is worth waiting until you can. This was fairly cheap lesson as I can use the blade in a Stanley/Bailey or a Record if I find one in a yard sale or flea market so I am only out about $34. An additional thought, when looking for a school or an instructor to teach you something new, pick a person that is not only knowledgeable but someone who can explain what they are teaching in plain english and not just technical jargon.

As I mentioned earlier, Alan gives us impromptu lectures on different phases of guitar making quite often. At a class in early December, I ask him about different types of wood used for making soundboards. For the next hour he sat and explained the properties of wood and their relationship to sound. This was done in language that I could understand together with an introduction to some technical terms. Alan is not only a highly respected guitar maker, he is also a good teacher. If you really want to learn, this is the type of person you want to learn from.

I want to leave you with this message especially if you are new to the Guild and to woodworking. There are many opportunities and new challenges in the field of woodworking. Take advantage of them and also take advantage of the Guild scholarship fund. They have been very generous in assisting us with this project.

I’ll let you all know how this turns out. My main concern right now is learning how to play the darn thing.

A recent trip to Newington, NH, provided the first lesson. The GROZ plane, a copy of the old Record, proved to be a disappointment. The blade adjustment mechanism was poorly designed, and I spent more time playing with it than using the plane.

Another lesson came from Alan Carruth, who offers impromptu lectures on different phases of guitar making. His explanations were clear and inclusive of technical terms, making the learning experience enjoyable.

If you’re new to the Guild and woodworking, take advantage of the opportunities and consider the Guild’s scholarship fund. The focus should be on learning from knowledgeable instructors who explain in plain English rather than technical jargon.

For more information on the Alan Carruth School, go to www.alcarruthluthier.com.
The lowly peg has many uses in woodworking – from holding something on the wall to holding together a furniture joint. Most commonly, we use round pegs to hold mortise and tenon joints together. However, pegs do not always have to be round dowels. They can be square or oval or some other shape and can hold together more than just a mortise and tenon joint. I have used them to lock sliding dovetails, secure dovetails in drawer boxes and to add decorative elements to a project. There are numerous ways to peg a joint and I will cover a few of those here.

As seen in the photo on the opposite page, I have pegged a dovetail joint together. In this case, the joint is intrinsically weak as I designed the drawer so the dovetails were visible on the front instead of the side. Every time the drawer is opened, the joint is being pulled apart. The pegs (one inch long with two on the top and two on the bottom) ensure the joint stays closed.

I have also secured table legs and aprons using oval and square pegs. I find the typical round peg to be a bit boring and I like the added interest that an oval or square peg adds to a piece of furniture.

So how do you get that square peg into the round hole? There are number of ways. After laying out the location of the peg, I start by drilling a ¼” hole with a brad point bit. The brad point makes a clean hole and has a flat bottom. A Forstner bit would also be a good choice. Using a very sharp ¼” chisel, I begin to make the hole square. Make sure you do not make the hole too big. Do not worry about making the hole square its entire depth. It is more important that the surface of the hole be clean and chiseled square. Try to clean any chips out of the hole before driving the peg into it.

To make the peg stock, I usually use a contrasting exotic wood such as ebony, rose wood or blood wood. Exotic woods are often an interesting color and they are usually harder than the domestic woods we typically use. If you have chiseled a nice ¼” square hole, start with a square piece of peg stock about 12” long. It should be just over ¼” square or more precisely, it should just fail fitting into your chiseled hole.

I find that ¼” square stock fits into my pencil sharpener which does a real nice job rounding one end of my peg stock. If your pencil sharpener does not work, use a knife to round the end of stock. The rounded and tapered portion of the peg should be about three-quarters of the depth of your hole.

With a little dab of glue on the peg stock, use a metal hammer to drive it into the hole. Listen to the hammer taps and when the pitch changes, you know you have bottomed out in the hole. If you whittled just the right amount of the peg and chose a very hard wood, the peg should have done even more work squaring and cleaning up the hole.

Using a Japanese flush trimming saw, cut the peg close to the surface. Then use a chisel to pare it flush.

Do not use a sander. Remember, your peg material is harder than the surrounding material and it has end grain showing which is even harder to sand. If you use a random orbit sander with a relatively soft pad, you will end up sanding off a lot of the surrounding material and the peg will still stand proud.

This does bring up one style option. If you are building Craftsman style furniture, you may well want the peg to stand proud of the surface by an ¼” or so. Use a sharp chisel to shape the peg into a traditional craftsman style peg.

The oval peg on the opposite page is just a round dowel that looks oval in the finished product. To accomplish this look, I drilled a ¼” hole in a block of wood at some long forgotten angle – let’s say 30°. You can try different angles to achieve the effect you want. This block then became my guide block for drilling holes into the table leg and through the tenon using a portable drill and ¼” drill bit.

Chris Kovacs is the editor of the Eastern Massachusetts Guild of Woodworkers’ newsletter as well as a GNHW member. This article first appeared in the EMGW newsletter and is reprinted with permission.

Square Peg in a Round Hole

by Chris Kovacs

Square peg locking a tenon on back of a book shelf

Square peg and sliding dovetail

Square peg and sliding dovetail

Square peg and sliding dovetail
major tuning. Their highly polished finish hides a multitude of sins.

One of the oldest makers in England, Robert Sorby is a step up from the Crown in both price and quality, but occasionally still suffers from steel which is a bit too soft. They do however require very little flattening of the backs and little honing of the bevels.

A very popular chisel is made by Hirsch of Germany and marketed with different handle styles under both the Hirsch and the Two Cherries brands. These are an excellent buy with great steel, good durability, and they require relatively little prep work. The only two caveats are that they require soaking in lacquer thinner to remove the protective lacquer coating from the steel, and the different handle styles should be tested to see if you find them comfortable.

Another European entry is from Pfeil in Austria and is marketed under the Swiss Made label by Woodcraft. These too are chisels with good steel and an excellent reputation.

At the upper end of the quality and price spectrum are the offerings by Ray Isles and Lie-Nielsen.

The Ray Isles are offered in both a butt chisel, which they call an American Pattern, and in a standard full length bevel edged bench chisel. The steel is excellent, the backs require very little flattening, the handles are comfortable, and they are priced accordingly.

The Lie-Nielsen bevel edge chisels, unlike all of the other chisels reviewed, are not tanged chisels, but are of the socket type. A taper on the end of the handle fits into a socket on the end of the steel portion of the chisel. The handles are of a comfortable design though small for someone with large hands. An optional long and large handle is available. The A2 tool steel is of excellent quality, properly hardened, and the backs need almost no flattening. A minor warning is that A2 is more difficult for the beginner to sharpen to the same level of sharpness as all of the other chisels made of high carbon steel. This problem goes away once you have further developed your sharpening skills.

In summary, as long as the chisels you buy fit your hand and have good quality properly hardened steel, your main choice is whether you have more money or more time. Increases in quality are generally those things like flattening, honing, and tuning which cost money to perform, but which you can do yourself. As you would expect, quality increases are priced accordingly. The sidebar lists some web sites and sources of supply.

**Bench Chisels – Sources of Supply**

<table>
<thead>
<tr>
<th>Web Site</th>
<th>Brand(s)</th>
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<tbody>
<tr>
<td><a href="http://www.leevalley.com">www.leevalley.com</a></td>
<td>Hirsch, LV</td>
</tr>
<tr>
<td><a href="http://www.lie-nielsen.com">www.lie-nielsen.com</a></td>
<td>Sorby, Two Cherries</td>
</tr>
<tr>
<td><a href="http://www.thebestthings.com">www.thebestthings.com</a></td>
<td>Crown, Sorby, Pfeil, Irwin</td>
</tr>
<tr>
<td><a href="http://www.woodcraft.com">www.woodcraft.com</a></td>
<td>Ray Isles, Sorby, Two Cherries, Crown</td>
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<tr>
<td><a href="http://www.toolsforworkingwood.com">www.toolsforworkingwood.com</a></td>
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Other sources are available for many of these brands.
This fall I took a three day hat turning course with JoHannes Michelsen thanks to a Guild Scholarship. What a delight! I have seen JoHannes at least three times over the years make hats and I had always been greatly impressed with his turning skills as well as his warm personality. I wanted to make a hat, but more importantly, I wanted the skills needed to turn that carefully. There were three of us for the course, all of intermediate skills, and we all left with a beautiful hat as well as new skills and a greater appreciation for JoHannes.

The first afternoon at his shop in Manchester, VT, we watched and took notes as he turned a hat. The next day we all made a hat, and the last morning we all tried to make a mini-hat. At every step of the way, our patient teacher was there to help us along. One turner ruined two hats before he got one to take home (JoHannes quickly turned another to the point just before destruction and let him go forward from there!)

So, what specifically did I learn? First, I have never seen such a large and powerful bandsaw! We all came away with mega-bandsaw envy. JoHannes quickly turned huge chunks of cherry into rounds just right for a hat (there went 20 lbs!)

Next, I worked on his personal lathe which was a turn of the century monster – massive cast iron is really good! Coring the hat removed another 10 lbs and that became the blank for the mini-hat.

Then came the patient, exacting turning to the thinness needed to produce a 6 ounce hat. JoHannes has his own grind and is developing his own line of gouges – stay tuned for these – we tested prototypes and they are really good! I cannot explain the grind, but come over to my shop and I’ll show it to you. It really reduces catches and allows for that very, very fine cutting to make a ¼” thick hat. The rear edges are swept back and require some practice at the grinder, but it isn’t really that hard to learn.

Then it was lunch time – breakfasts and lunches are provided and are congenial, wonderful breaks! Then, the neat light bulb inside the hat trick to see the depth of the cut – ala Peter Bloch’s lamp shade turning. And then, magically, we all had hats by supper time. They went into the bender overnight to make the hats fit our heads. The mini-hats on Sunday gave me fits and I don’t have one to show you let alone the micro-hats that JoHannes turns with two sets of reading glasses on!

I won’t go into the hat making business – I’ll leave that to JoHannes – but I will approach my turning differently now. I’ll teach you his grind if you want, and I’d be happy to show you my hat and tell you more about the course if you are interested.

You can go online to his website to learn more too – www.woodhat.com. I can certainly recommend it for any intermediate turner. Once again, many thanks to the Guild for the scholarship!
Indoor air quality is an important issue for the luthier and woodworker to consider. While certainly not a glamorous topic, the benefits of learning some of the important concepts (and making appropriate changes to protect your health) are certainly worth the effort.

Like most of us, I look forward to my time in the shop. The pleasure of woodworking is tempered with chores though, and I spend some time cleaning up the place before and after each work session. When I first walk in, it looks fairly clean. However, upon closer inspection, I find a thin layer of dust is actually covering a surprising number of the surfaces. This became more apparent to me recently when my son and I remodeled our basement shop, and the tremendous amount of dust hidden in the crevices became visible. In addition, my son began to wheeze within a few minutes of entering the shop, and only fresh air provided relief.

With this in mind, the larger problem of indoor air quality in general beyond the issue of just dust began to interest me. Although a paper such as this cannot present an exhaustive discussion of the field, my goal is to highlight some of the particular issues facing woodworkers and luthiers, who often work in home and especially basement shops.

Clearly, there are certain costs that breathing poor quality air may bring. In addition to the obvious personal health care risks, with their attendant costs of health care provider visits, medications, etc., there is also a substantial risk of dust related damage to equipment and decreased productivity. The topics I will touch upon include general principles of indoor air quality theory, a basic discussion of air cleaning and filtering technology, and finish with some practical suggestions for surveying your shop and making some healthful changes.

I checked with the Environmental Protection Agency and confirmed that there really are no regulatory standards that govern the home shop, so in making my recommendations, I have relied on putting together all of the available material that I could find, and have deliberately aired on the conservative side of the street. In reality, most woodworkers will likely remain healthy throughout their careers. However, since most of the dangers that are in the shop are invisible, such as small particulate dust and radon, and each of us has a different and unknown sensitivity to these factors, then it seems reasonable to do what we practically can to protect ourselves and preserve our health.

**Basic Theory**

The basic considerations in looking at indoor air quality for our purposes include:

1. Airborne dust (wood, metal, abrasives and other suspended particles).
2. Volatile chemicals (stains, finishes, solvents, etc.)
3. Biologic problems in the workplace, such as molds and bacteria
4. Radon
5. “Human issues” such as carbon dioxide, tobacco smoke and noise and lighting issues.

**Airborne Dust – Especially Wood Dust**

In general, health risks of dust are inversely proportional to the size of the particle. Larger particles, such as wood shavings and the largest of the dust particles, fall to the ground quickly, and while they may pose a fire hazard, tend not to be much of a direct health risk. With smaller particles, however, the risk is substantial. Particles less than 10 microns (millionths of a meter) in size will remain suspended in the air for many hours, and can be deeply inhaled into the lungs. Although the nose can filter upwards of 500 cubic meters of air per day, it makes a relatively poor small particle scavenging mechanism and really serves more for humidification of the respired air. The smaller particles (ranging from around 0.3 to 10 microns) are the most dangerous with respect to respiratory problems, as they have the ability to remain suspended in the air until they reach the deepest recesses of the lungs where they become trapped. Particles smaller than 0.3 microns, interestingly, are often able to escape from the lungs, as they remain suspended in the air column, but are not without their risks. In 1979, Ervin Somogyi, in his article for this journal *Wood Dust – Beware*, performed an analysis of the size of the particles found in his workshop. Particles in the portion of the shop where power tools were used ranged from 2.6 to 660 microns, with significant concentrations of sizes ranging from 27 to 260 microns. In the room where he performed more hand sanding operations, the particles were much smaller, ranging down to 1.5 microns. Interestingly, he found a significant concentration amongst the smaller particles of the sanding abrasive itself, in addition to wood and the other materials sanded, such as bone and ivory.

In researching this article, it soon became apparent to me that almost every species of wood, including hard and softwoods, tropical and non-tropical, have all been associated with health risks.
It is not even clear whether the wood itself is the culprit, or any number of organic extractives in the wood may be to blame. Some of the commonly cited causative extractives include classes of compounds such as alkaloids, tannins and aldehydes. During the life of the tree, extractives do serve important biologic purposes (e.g. natural insect repellents), but clearly may have toxic properties for humans. Keep in mind that in some cases wood contaminants, such as fungi, glue residue or left over paint or stain may be responsible as well. Therefore, the dust from any type of wood should be thought of as potentially hazardous. In general, remember that the finer the dust, the greater the risk.

What then, are the risks of wood dust? In general, they can be divided into certain broad categories. I will concentrate here on personal health risks, although it should be noted that the risk of fire increases in a dusty shop as well. Also, dust buildup in power tools significantly degrades their operation and safety as well.

Broadly speaking, the major categories of health risks include skin rashes (known as “contact dermatitis”), asthma and nasal cancers.

Contact dermatitis – The symptoms of a contact allergic dermatitis may include itching, redness of the skin and hives (raised, fluid containing vesicles). The eyes may be affected as well. In most cases, repeated sensitization is needed, but since cross reactivity exists between many wood species, an apparent reaction can occur even if the individual has not contacted that particular type of wood before. Further, a long time can pass between the initial exposure and subsequent exposures, making the diagnosis more difficult. If a contact dermatitis is suspected, a “skin patch test” can be done at a physician’s office to determine if, in fact, the wood is responsible. While many of the symptoms can resolve over hours or days after the exposure, in some cases treatment with medications may be needed. Keep in mind that these reactions can occur even on parts of the body that do not seem to be exposed, since fine dust particles can easily get inside clothing. One simple strategy that may be helpful is to wash your hands periodically, and keep them moisturized, which acts both as a barrier to exposure as well as to reduce the incidence of cracking in the skin. There are many web sites that have color photos of the typical skin rash of dermatitis, such as: www.nlm.nih.gov/medlineplus. Once there, click on “Medical Encyclopedia”, and then navigate from there to “Dermatitis”.

Respiratory Problems (asthma) – One of the greater risks associated with the inhalation of wood dust is that of developing asthma, a form of chronic obstructive pulmonary disease (or “COPD”). In the short term, symptoms may include sneezing or coughing, tightness in the chest or wheezing or a feeling of restriction when trying to breathe. In fact, a good clue is that these symptoms may start soon after entering the shop, but in some cases may become noticeable in the evening after work. Some patients have had cold like symptoms, such as a runny nose, that have persisted for years. Needless to say, if one is a smoker, the risk is that much greater of developing chronic respiratory problems in this situation. In the long term, COPD may lead to shortness of breath even outside the woodshop, sensitivity to other inhaled agents, or even congestive heart failure. As with contact dermatitis, there have now been so many species of wood associated with asthmatic change in the literature that it would be prohibitive to list them all here, but in my review, I eventually found almost all of the more commonly used lutherie woods. Again, cross reactivity probably exists between some species, and woods with a higher amount of extractives, such as cedar, may be more able to produce these types of responses. If you believe that you have developed any changes in your breathing ability or comfort, it is important to discuss this with your doctor. Before a visit, make a list of all of the types of wood, solvents and finishes that you use in the shop, as well as a family history of any respiratory problems. This information will definitely be useful in helping to make the diagnosis.

Cancer Risk – A fair amount of epidemiology data over the years has confirmed the fact that long term exposure to wood dust, particularly that of hard wood species, may increase the risk of developing nasal cancer. Whether this is due to some intrinsic difference in the chemistry of hardwoods, or whether more respirable dust is created during the sanding and shaping of hard woods is not known. Although other tumors such as lung cancer and Hodgkin’s disease (a type of lymph node cancer) have been evaluated, no firm evidence exists that exposure to wood raises the risk of developing these diseases. In some cases, many decades of exposure elapsed before nasal tumors appeared, therefore long term studies have yielded the best information. For example, 22% of the deaths attributed to nasal cancer in North Carolina between 1956 and 1974 occurred in furniture makers. Increased incidence of nasal cancers has been reported in furniture makers in many other countries around the world as well.

Volatile Chemicals

A wide variety of volatile chemicals, both organic and inorganic, may be found in the home shop. While many of them are related to woodworking activities, such as finishing agents, solvents, lacquers, etc., the home basement shop also may contain combustion products from furnace operations (such as polyaromatic hydrocarbons and carbon monoxide), tobacco smoke and pesticides. So-called “off gassing” may occur from carpets, insulation materials and construction adhesives, and may present a risk as well. Simply being able to smell these agents does not imply that they are causing a health risk, but a healthy guide is to work to bring these levels as low as possible, primarily by bringing a fresh air source into the workspace. When working in close proximity to these agents, other steps may be used such as wearing an approved mask or respirator.

Biologic Problems

The basement location of many shops may present several unique biologic problems. First, many basements are moist, providing a potential growth opportunity for molds, bacteria, algae, and insects, all of which pose a potential threat to human health. Common sites of growth may include the concrete
walls, either unfinished or behind finishing panels, under or in carpeting or insulation, and in the filters of air cleaning units or in the drip pans of dehumidifiers, which many of us use in basement locations. The primary risk of these organisms is that they may cause infectious disease, allergies, or act as a skin or respiratory irritant.

Radon

Radon is a colorless, odorless gas formed by the radioactive decay of radium (a naturally occurring element found in soil). As radium changes into radon, it can diffuse into the air and dissolve into water. The highest concentrations of radon are found in the basements of homes. Radon accounts for about half of the naturally occurring radiation that we are all exposed to during the course of normal life, and is present in 5 to 10 times greater quantities indoors. The main risk of radon is that it has been linked to the development of lung cancer. All basement shops should be tested for the presence of radon and if high levels are detected steps must be taken to lower the levels. The National Radon Information Line can be reached at 1-800-767-7236.

As a final thought on the health impact of environmental factors in the home shop, I should also encourage all of us to be aware of the need for adequate lighting and control of excess noise.

Strategies for Lowering the Risks

Having briefly discussed some of the potential sources of risk, how do we go about protecting ourselves? First, we have to recognize that a problem may exist, even if the shop looks superficially clean. A close inspection, perhaps with a friend or colleague who is not very familiar with your shop, can be invaluable in assessing at least the degree of visible dust, the adequacy of lighting and noise containment, and the presence of any unpleasant odors that could indicate either volatile chemical products or molds or bacteria. Commercial kits are available for radon testing, and should be used in accordance with the manufacturer’s instructions.

Close attention to one’s personal health is also important, and signs or symptoms such as a cough, rash, headache, watery eyes or breathing difficulties may signal an environmental problem. Keep in mind that these symptoms may not necessarily start immediately upon entering the shop, but may be delayed until hours later.

In general, all airborne hazards, such as dust and volatile chemicals (including tobacco smoke) become more hazardous as their concentration increases. Therefore, allowing a fresh air source into the shop is critical, as long as the source of that air is not contaminated itself. The temperature and humidity are important as well. As temperatures go up, bacterial growth increases, and off gassing from carpeting, for example, may increase as well. Relative humidity is probably best kept between 30 and 50%, with low humidity increasing the likelihood of skin irritation and higher humidity increasing the growth of biologic organisms.

Air Filtration Units

Many of us use air filtration systems in the home shop, with a goal to reduce the microscopic particles as much as possible. There are several types of air cleaning units available for home use. Some are free standing “bench top” models, and others may be hung from the ceiling. There are several basic types of units. In general, all of these operate by drawing air into the unit with a fan, and forcing the air through some type of filter, which can be either purely mechanical or electrostatic in nature. Filter types are as follows…

HEPA filters – HEPA stands for “high efficiency particulate air”, and to make this claim the filter has to be able to remove 99.97% of particles from the air greater than 0.3 microns in size. This would include the majority of dust particles found in the shop setting. ULPA (Ultra-HEPA) should be able to remove 99.999% of these same particles.

Electrostatic precipitators and electrostatic filters – These units charge the filter with an electric charge in order to theoretically increase the amount of dust attracted to the filter.

Ionization filters – These units add a small electric charge to the air stream being filtered to attract dust particles to the walls and floors, thus removing them from the respirable air. These units may therefore eventually soil these surfaces.

Note that both electrostatic and ionization type filters may produce ozone, which is not a desirable by-product.

Air filtering units can be rated in terms of their “clean air delivery rate (cadr)”, which refers to the volume of filtered air delivered by the unit. The higher the “cadr”, the more air is being filtered. In general, choose a model of air cleaner that has a cadr rating number at least ⅔ that of the room’s floor square footage. The website www.cadr.org (a service of the Association of Home Appliance Manufacturers), provides comparison data for participating manufacturers. Proper maintenance and filter changes are very important (set up a schedule!), as all filtering units lose their efficiency as they clog and become a haven for bacterial and mold growth. Many units also have washable filters, which is a nice feature. I would recommend that every shop have at least one of these units, preferably a HEPA rated air filter to help control airborne dust. The size of the model may be based on the unit’s rating for a particular size room. Air filters should be placed in a part of the shop where they have access to good circulation throughout the work space. While controlling dust suspended in the room is always a good idea, there is no substitute for a fresh air source.

A note on ozone – Ozone generators are sold by a number of manufacturers as air cleaners/purifiers. Ozone occurs naturally in the upper atmosphere of the earth, where it acts to absorb some of the ultraviolet radiation that would otherwise reach the Earth’s surface. In a closed space, however, ozone is harmful to humans, and may cause throat irritation, worsen asthma, and lead to lung problems. There is no convincing evidence that ozone technology provides any significant air cleaning ability, or that it neutralizes volatile chemicals in any way that would justify the risk. An excellent source of more detailed information is the Environmental
Vacuuming

Controlling the pollutant dust at its source is one of the mainstays of improving air quality in the shop. If practical, all power tools that generate significant quantities of dust should be hooked into a properly grounded vacuum system to reduce the amount of dust that is free to get into the air. Electric grounding lowers the risk for static electricity induced fire in the dust. I usually vacuum the floor at the beginning of a work session to get the dust that has settled overnight and again at the end of a work session to get the dust that has been visibly generated. I make sure to vacuum the workbench and all of the little dust hiding places that I have discovered as well. I try to avoid sweeping unless there is an unusually large quantity of larger dust and wood chip particles, and then I sweep slowly to avoid stirring up extra dust. Sanding seems to generate the largest number of small particles, and there are a few strategies available to lower the risk. First, consider sanding outdoors (and using volatile organic chemicals outdoors) if the weather permits. It’s a great way to decrease the amount of dust that you breathe, and the view is certainly more interesting than in my shop, for example! Keep in mind that vacuuming does not guarantee that the air will be kept clean, however, as a surprising amount of dust may escape from the bag directly into the air. If hand sanding must be done indoors, consider the use of a sanding table equipped with a vacuum duct drawing air through the surface. If the job allows it, wet sanding will decrease the amount of fine particulate that reaches the air as well.

Masks

For particularly dusty operations, or when using volatile chemicals indoors, the use of a properly fitted, clean mask or respirator is prudent. One of the most important things to remember about masks and respirators is that you must choose the proper model for the job at hand. Masks use both a lettering and numbering system that defines their use and efficiency. The system is as follows: N = protects against aerosol particles free of oils (e.g. wood dust); R = protects against oily aerosol particles; P = protects against very oily aerosol particles. The number rating that follows gives the mask’s efficiency in terms of filtering out a percentage of the particles. For example, a simple mask such as the 3M sanding respirator, used for wood dust protection, carries a rating of N95, demonstrating 95% efficiency in filtering out non-oily aerosolized particulate such as wood dust.

Masks should be tightly and properly fitted to lower the amount of air that gets in around the mask and replaced when breathing through them becomes difficult or in accordance with the manufacturer’s recommendations. In general, most simple masks do not provide protection against volatile vapors. For this purpose, a properly chosen respirator with replaceable cartridges is a much better choice.

Dermatitis Protection

There are a few strategies that can be used if skin sensitivity becomes an issue. First, gloves may be worn during the steps that have been shown to be irritating to the skin in the past. Hand washing helps reduce the amount of irritant on the hands, but does little to protect other parts of the body that may be exposed to dust even under the clothing. If possible, the use of a skin moisturizer may act as a barrier to lower the amount of direct particle contact with the skin.

A Few Final Thoughts:

Carbon monoxide sensors and fire detectors with battery backup are always a good idea, and be sure to test the “peak” reading from time to time if the unit is so equipped and to change the batteries on a schedule. Proper maintenance of the home furnace including filter changes can certainly improve the general air quality in the shop as well, particularly in the winter months when it becomes more difficult to open the windows and bring in fresh air. Carpeting should probably be avoided in the workshop. Check for radon, and take steps to lower it if high levels are found. Provide proper lighting for yourself, and take steps to lower the exposure to unnecessary noise including wearing ear protection. Keep your hand and power tools sharp, as dull tools produce more dust.

In summary, be aware that certain risks may exist in home woodworking shops. While specific recommendations regarding air quality standards exist for the industrial workplace, they are not readily available for the home shop. Although it is not practical to remove all of the potential risks in the shop, it is reasonable to study your unique situation, and take some reasonable steps to at least lower your risk. Use the three guiding principles of bringing in fresh air, controlling the pollutants at the source and cleaning the air if possible. Above all, always respect your health. It is your most important asset.

References

5. Medline and Toxline (internet access) of the National Library of Medicine.
6. Environmental Protection Agency Web site: www.epa.gov. This site contains much useful information, particularly the sections on indoor air quality.
8. The 3M company runs a website called www.filtrete.com, which provides useful educational information on filters and masks.
meetings and events

Jan 27th, 2007

Granite State Woodturners

from a log to a bowl – meeting at Scott Ruesswick’s shop in Canterbury, NH

by Marcel Durette

The atmosphere was festive to say the least. Scott and Barb, always the perfect host and hostess, provided not only coffee, but pastries and more importantly, seating for almost everyone! No small feat for such a group.

Jon Siegel reminded us of the benefits of being a dues paying member of the GNHW as well as the AAW. Dick Batchelder reminded us that Jon has served as president of the GSWT for three years and urged us to consider stepping up. He assured us that the candidate would have the support and backing of all the past presidents!

Ron was introduced and quickly took control of our attention. Noticeably well prepared, he came complete with props and fresh from having given the same demo only two days earlier at the CNEW meeting. He gave us tips, ideas and instruction ranging from safety and the importance of a face shield, to fiddling with a jam chuck to turn the bottom of the bowl – he finally resorted to the paper towel trick!

Quoting Andy Motter several times during his demo, Ron shared Andy’s approach to bowl turning which is breaking it down to its three components – the outside, the inside and the bottom or foot of the bowl. Although expensive, Ron made a strong case for buying a chuck. I became convinced when he had such difficulty in re-centering the blank on the faceplate to hollow out the inside. Forty-five onlookers didn’t make it any easier either!

While claiming to favor the \( \frac{3}{8} \)” bowl gouge with the side grind made famous by David Ellsworth, he also uses a \( \frac{3}{8} \)” bowl gouge for some finish cuts in the interior part of the bowl. When asked why, he simply responded, “Because I like it”. Of course he elaborated on the reason but to this writer, he had summed up his approach to woodturning. Ron is comfortable at the lathe and has a solid base of knowledge about the craft, and he likes it! It shows.

Jon gathered everyone to the opposite end of the room where the auction was to take place. Watching him auction off all the great stuff that people brought, including some bubinga donated from Rockler, is always great fun. I swear that he could have you bidding on your own shirt and you’d probably thank him for it as you handed over the money! He raised almost $350 for the guild in less than an hour. I collected the money from the winning bidders and you know what, all of them thanked me! Nice job Jon.
The GNHW BIG met on Saturday, February 3 at Bob LaCivita’s shop in Nottingham, NH for the third part in the cabinet design and construction series.

The meeting opened with an examination of the effects of the passage of time on the parts of our cabinet. The top and sides were in good shape but the shelves had developed some cupping which may require a design change.

The lesson for the day was the tapered sliding dovetail, which is the joint we will use to attach the sides to the top and bottom of our cabinet. The point of the taper is to have the initial fit of the joint loose and then tight when the part is in its final position. Bob stressed the importance of marking all the parts to insure that all the cuts are made on the proper pieces and everything lines up. The slots are cut in the top and bottom pieces while the male dovetails are cut on the sidepieces. The first cut is made with a straight router bit to clear out the slot.

Following this, the slot is finished with a ten-degree dovetail bit. This angle was selected to match the angle of the ECE dovetail plane that will be used on the mating male joint. You have to pay attention to the rotation of the bit and its relation to the direction of cut so that you do not break out the wood as you cut each side of the slot. You also must not lift the router at the end of the cut but continue until clear of the wood. This is because of the taper on the dovetail bit.

After routing, the slot is cleaned up with sandpaper to make fitting easier. When the top and bottoms are slotted, both pieces get their final surfacing before the male dovetails are cut on the sides so that the depth will be right and everything fits tightly.

To begin, on the sides, we use the slot we cut in the top to set the proper height for the bit in the router table. Bob makes a couple of test cuts in some scrap to make sure everything is lined up properly.

At this point, we stop and choose the actual top and bottom pieces of the cabinet based on the presence of any defects and the figure of the wood. The male dovetails on the sidepieces are initially cut straight to fit the wide end of the tapered slot. We will make multiple cuts to work our way to the precise size we need.

The final taper is done with the dovetail plane. This is achieved with multiple passes of the plane with each cut starting closer to the end of the board that will be the narrow end of the taper. After several passes, we make a test fit to ensure that our joint will fit tightly. This process is repeated until the full taper is achieved.

The meeting finished with the assembly of the shell of our cabinet.
The February general meeting was held at the woodshop on the University of NH campus in Durham.

In a departure from our normal format, Guild member Harvey Best gave a short discussion on a table he restored prior to our regular business meeting. A person knowing of the Period Furniture Group, asked its members to look over their damaged antique table and make repair suggestions. After examining the table at the PFG meeting Harvey, who has repaired furniture in the past, agreed to restore it. He brought the restored table, along with before and after photos to the Guild meeting and discussed his repair techniques.

If you have a topic or project you would like to share and give a short discussion on at an upcoming meeting, please let me know. Harvey’s discussion was so well received, I think the new format should be continued.

Dave Anderson then proceeded with the regular business meeting. The discussion then moved to meeting attendance. A poll was taken as to what influences attendance at a Guild meeting. Was it the location, demonstrator, topic, or do you just go because it’s a Guild meeting? It seems that most people go because it’s a Guild meeting and they can meet with like-minded individuals.

The main presenter was David Upfill-Brown. He is the lead instructor of the nine-month comprehensive class at the Center For Furniture Craftsmanship in Rockport, ME. He called his lecture Taming the Beast. Normally everyone sits in their chair and watches a demo at a workbench. Not this time. We all gathered around each individual machine in the shop. Going from drill press, to bandsaw to jointer, to tablesaw to lathe. David discussed how to operate each tool effectively, with a big emphasis on safety. He also discussed various jigs and fixtures used with each tool. Maintenance and tuning of the machines was also reviewed. David’s frankness and sense of humor added spice to the talk.
Unfounded concerns that Period Furniture Group standards intimidate members and discourage all but the most accomplished have been forever put to rest. At the March meeting, we strongly encouraged less experienced members to show off their projects and so were more than a little concerned when Guild President Dave Anderson said he planned to bring the Queen Anne tea table he has been working on for over a year.

Oh, dear, we thought, Dave’s piece will so outshine everyone else’s that people will be discouraged. Well, we never got to see Dave’s piece. He reports that when he lifted it up to carry it out to his car to bring to the meeting, all the legs fell off. He muttered something about maybe mixing the hide glue at the wrong temperature (for the record, it should be 140 degrees and not too thick - closer to cream than molasses in consistency). In any event we got to see three excellent works by group members.

Meeting host Mike Cyros showed off his tiger maple Shaker-style rocker. One of the neat things is that during construction, Mike sought and received from the group a lot of advice on what finish to use to make the figure really pop. As you can see, it does.

New member Mike Noel showed a granite-top coffee table that he designed and built using walnut and maple. Notice how his maple side rails contrast with the walnut stretchers. Furthermore, Mike had the design idea to turn the sapwood faces of his walnut legs outward and visible, rather than hiding them towards the center of the table, thus harmonizing with his side rails.

Also, we got to see Bill Daunis’ beautiful Queen Anne tilt top table which will harmonize well with the Queen Anne side chair Bill showed off at the last meeting.

Mike Cyros had arranged for us to meet Old South Church in Newburyport. This is the oldest wooden church in New England and has great historical significance. Its governance structure was a model for the US constitution. Benedict Arnold and his men mustered for the invasion of Canada from there. The church steeple has just been restored and members had the opportunity to climb up inside the steeple. Members entered the extremely narrow passage way and stairs, wondering if they would fit. As Mike put it: “I’m pleased that many of you ventured up into the attic and then all the way up the steeple with me to look at the early massive 1756 post and beam structure raised by Newburyport’s finest shipbuilders. How often is it that you get to see a 6” thick mortise and tenon joint into a 16” square x 40+ ft. hand-hewn white oak timber that was cut in the spring of 1756 along the banks of the Merrimac River.”

A Paul Revere bell graces the steeple. Inside the church, there is a view of the magnificent sanctuary.
Treasurer’s Report

The state of the Guild finances remains strong with income and expenses tracking on budget. This has been a quiet year compared to the last two in which we had the Joinery and Turning Symposums. Our major expense is the publication of *The Old Saw* and this year it will run close to $25 per member for the five issues. It should be noted that the Steering Committee voted to have three oversized issues.

The scholarship committee has been active and has awarded several scholarships and also some special grants. Of the $30 dues, $5 is directed to the education fund. The other major source of income for education comes from the Sunapee raffle.

Our other Guild expenses are minimal and income for auctions at the annual meeting and at the Turning Group meetings covers most of them.

The “enterprise” activities – book and magazine sales, clothing sales, and video sales are self sustaining. The revenue from the sales just about covers the costs.

Account balances as of 3/14/07

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If you do receive a Guild check, please cash is as soon as you can. Outstanding checks make it difficult to balance the checkbook and the bank may not cash checks that are more than 90 days old. Also, the cost of replacing lost checks is $20.

Peter James - Treasurer

Beginner & Intermediate Group

This year, Bob LaCivita is taking BIG participants through an entire project. *The project is a small cabinet with a drawer and two doors.*

The next BIG meeting is April 7. The meeting location is at Bob LaCivita’s shop at 365 Stage Road (Rt 152) Nottingham, NH from 9:30 am to noon. Please email or telephone (before 9 pm) if you plan to attend.

Bob LaCivita
603-942-1240 or rlacivita@comcast.net

Granite State Woodturners

The next meeting of the Granite State Woodturners will be May 26 from 9 am to noon. The location and topic is TBA. Contact DJ Delorie to be added to the e-mail notification list.

DJ Delorie: dj@delorie.com

Period Furniture

The next Period Furniture Group meeting is scheduled for May 12. In response to member interest, we plan to show samples and techniques for a number of staining and finishing methods.

To get on the email (or phone) list to receive meeting notifications, contact:
John Whiteside: 603-679-5443
or johninfremont@comcast.net

CLOSING SHOP…

Moving west and selling most tools from my shop in Enfield, NH.

Nova Comet mini-lathe – 10"swing, 14" long/adj on cap., #2 MT, 1"x8 TPI, ½ hp motor, 10 years old but barely used, very portable – $250

Powermatic 66 10" tablesaw on open roller stand, Biesemeyer fence, extension table, some jigs, 1 ph,(available end of June) – $1800

Porter Cable Saw Boss 345 circular saw, 6" blade left, dust ejector, carrying case, like new – $110

Kity bandsaw – 12" throat, 1hp, 4" dust port, tilting table, floor model on roller stand, extra blades(available end of June) – $200

Other tools, accessories, and some wood will be available by the end of June.

Mary Lou Bryant: 603-632-7480 or marylou.bryant@gmail.com

JOINER/PLANER …

Robland 12" Joiner/Planer in excellent condition. Comes with HSS, Carbide and disposable knives. 220 v, 3 hp. This is a great machine! – $975.

Peter Breu: 603-647-2327

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Suppliers offering discounts to Guild members

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<th>Tools &amp; Supplies</th>
<th>Wood Products</th>
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*Each supplier offers a minimum 10% discount to current GNHW members – some restrictions may apply. Ads are displayed in “The Old Saw” on a rotating basis.*
Each supplier offers a minimum 10% discount to current GNHW members – some restrictions may apply. Ads are displayed in “The Old Saw” on a rotating basis. See page 31 for a complete listing.