

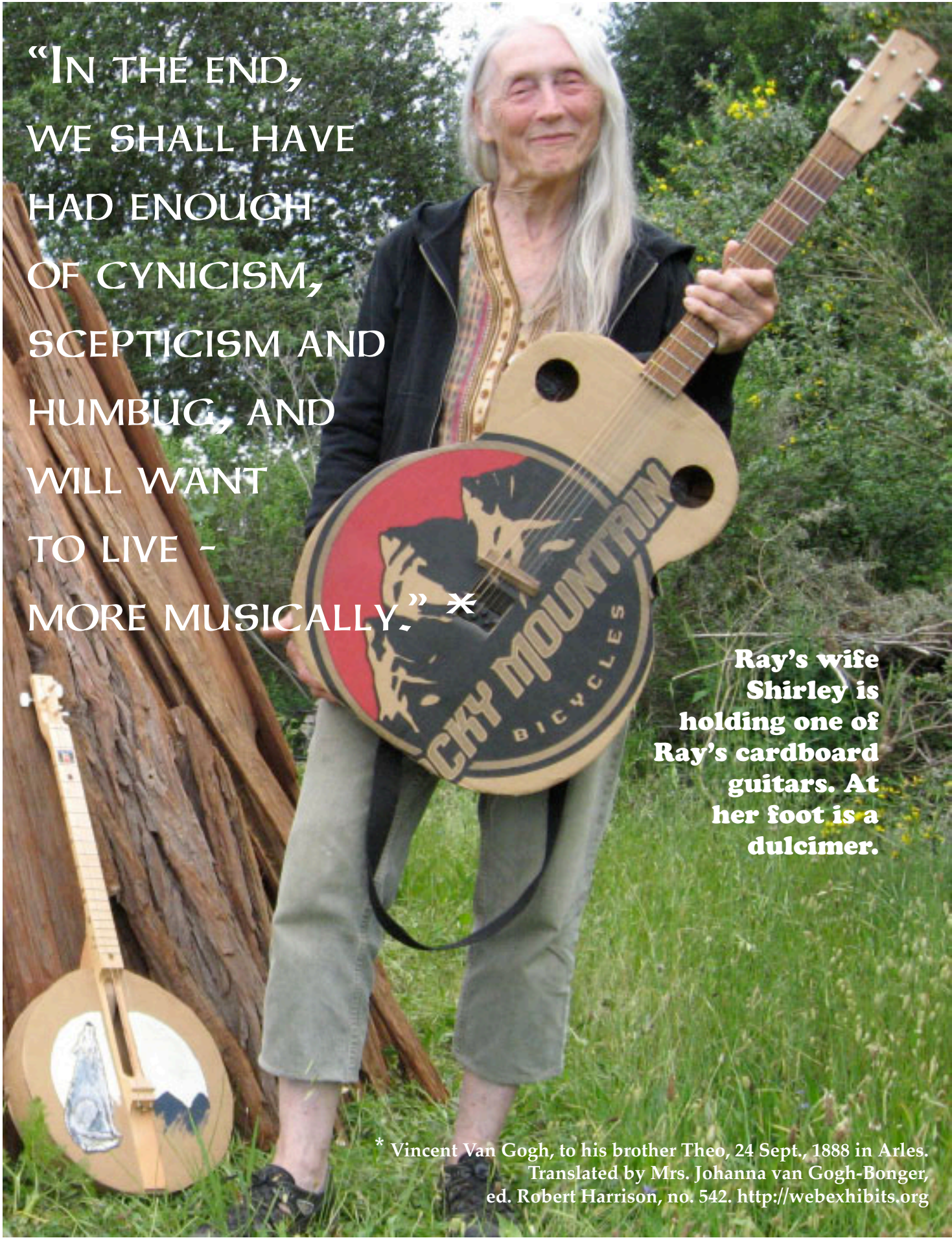
A man with a full beard and curly hair is smiling while playing a blue and white dulcimer. He is wearing a plaid shirt. The dulcimer has a blue body with white decorative patterns and text that reads "HAPPY NEW YEAR" and "DO". The background is a wooden wall.

# **MAKE A RAY JACOBS' ROCKY MOUNTAIN DULCIMER**

**MAKE THIS  
*GORGEOUS*  
SOUNDING  
INSTRUMENT  
FROM A 2x4,  
CARDBOARD, &  
PLYWOOD. IT'S  
CHEAP, BEAUTIFUL,  
& EASY-TO-BUILD-  
AND-PLAY.**

**by Kiko Denzer,  
with help  
and inspiration from  
Ray and Shirley Jacobs  
[HANDPRINTPRESS.COM](http://HANDPRINTPRESS.COM)**





“IN THE END,  
WE SHALL HAVE  
HAD ENOUGH  
OF CYNICISM,  
SCEPTICISM AND  
HUMBUG, AND  
WILL WANT  
TO LIVE –  
MORE MUSICALLY.” \*

**Ray's wife  
Shirley is  
holding one of  
Ray's cardboard  
guitars. At  
her foot is a  
dulcimer.**

\* Vincent Van Gogh, to his brother Theo, 24 Sept., 1888 in Arles.  
Translated by Mrs. Johanna van Gogh-Bonger,  
ed. Robert Harrison, no. 542. <http://webexhibits.org>



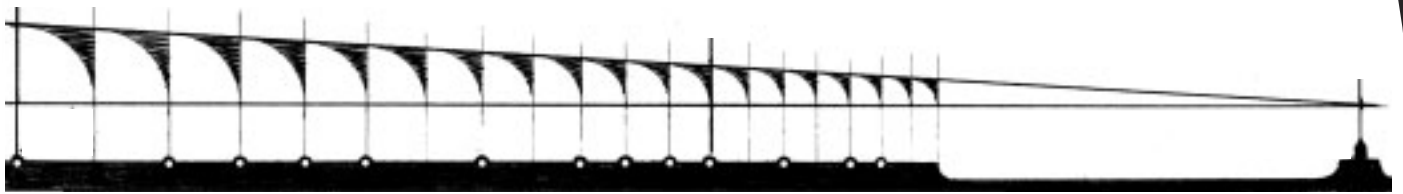
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**Make a Ray Jacobs' Rocky Mountain Dulcimer: Build this Gorgeous Sounding Instrument from a 2x4, Cardboard, & Plywood. It's cheap, Beautiful, & Easy-to-Build-and-Play**

**Kiko Denzer, January, 2013**

**ISBN: 9780615748931**

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# Contents

<b>Foreword</b> .....	<b>2</b>
<b>Introduction</b> .....	<b>3</b>
<b>Tools &amp; Materials: what you'll need</b> .....	<b>5</b>
<b>Step 1: The Neck</b> .....	<b>7</b>
Neck Dimensions (chart) .....	<b>8</b>
<b>Step 2: Frets: Locating Fret Slots</b> .....	<b>12</b>
Cutting Fret Slots .....	<b>13</b>
Get Your Frets in Place .....	<b>14</b>
Fret Chart .....	<b>15</b>
Prepping Frets for Glueing .....	<b>16</b>
Glueing the Frets in Place .....	<b>18</b>
Filing the Frets .....	<b>19</b>
Fret Ends .....	<b>20</b>
<b>Initial Shaping of the Neck</b> .....	<b>21</b>
<b>Fiddle Break! (Instrument photos)</b> .....	<b>22</b>
<b>Step 3: The Plywood Back</b> .....	<b>26</b>
Cutting the Blocks for Attaching the Neck .....	<b>29</b>
Glueing Blocks to Base .....	<b>30</b>
Glueing Neck to Body .....	<b>31</b>
Cutting Brace Blocks for the Cardboard .....	<b>32</b>
<b>Step 4: Selecting &amp; Cutting Cardboard</b> .....	<b>34</b>
Glueing Sides & Top .....	<b>36</b>
<b>Preview: How to Determine the Proper Bridge Height</b> .....	<b>38</b>
<b>Step 5: Lacquer Finish for the Neck</b> .....	<b>39</b>
<b>Step 6: Fitting the Cardboard Top</b> .....	<b>40</b>
<b>Step 7: Remanufacturing Tuners</b> .....	<b>42</b>
<b>Step 8: Tuners: Installing</b> .....	<b>44</b>
Mounting Tuners .....	<b>45</b>
<b>Step 9: Mounting the Bridge</b> .....	<b>46</b>
<b>Step 10: Mounting Strings &amp; Finishing the Bridge</b> .....	<b>47</b>
<b>Play your Dulcimer</b> .....	<b>48</b>
<b>Basic Chord Chart</b> .....	<b>50</b>
<b>Musical Resources</b> .....	<b>51</b>
<b>STORIES: Meeting Ray</b> .....	<b>52</b>
FAME: An American Teacher & her Czech Students	
Learn About Language & Harmony .....	<b>59</b>
<b>About Hand Print Press (other titles)</b> .....	<b>61</b>
<b>Dulcimer Kits &amp; Cottage Industry: ordering &amp; participating</b> .....	<b>62</b>



**I** MET Ray Jacobs one May in California; he was teaching people to make something that looked like a 3-string banjo out of cardboard and scrap wood — but it sounded... **...amazing!**

It looked so simple, I thought “shoot, I could play that!” Ray told stories about 20 years of teaching fourth graders, not just so they could make and play these simple, 3-stringed instruments but so they could participate in the world. He put an old V-8 engine in the classroom and challenged them to take it apart and put it together; he took them to a local pond to squelch and splash and take buckets of pond water back to class, where they put it in split 55-gallon drums so they could play and learn when their “other work” was done; he shepherded 20 generations of kids into 5th grade, many of them with dulcimers they had made themselves, on which they could all play melody and chords — extraordinary gifts!

I thought, “someone should put this into a book so every 4th grade teacher can do what Ray did!” I’ve been a “teaching artist” in the Oregon schools, and know how tight the budgets are and how difficult it is for kids to get good, hands-on activities. When teachers are so bound by schedules, test requirements, and policy that they can’t afford to engage kids in anything not specified in the curriculum, it takes an outsider to do the creative projects.

Life and beauty grow by exchanges of gratitude, grace, and peace, by which we learn about love and feeling and how to belong to something larger than our own



small selves. It comes naturally, asking only that we participate. Participation makes community, and community makes the soil where beauty feeds and culture grows.

Ray’s dulcimer is the kind of gift that makes it possible. But to measure the exchange only in dollars is like trying to grow a garden on concrete. Seeds — *life!* — need dirt, and dirt came as a gift long before we divided and converted it into a speculative commodity. Real estate, property, (intellectual or material), belongs to life, as we do. If we make merchandise of everything we think, feel, say, or make, we enslave ourselves. A free people sing, celebrate, and share. Ray told me, “if I can spend an hour or two making music, it’s a good day.”

This book is published under a creative commons license: please share the free PDF. The paperback can be had from Hand Print Press or Amazon; that price helps pay production, distribution and, (perhaps) some living and working expenses for author and family. Ray also sells instructional CDs, instruments, as well as his and Shirley’s music. Write them at POB 794, Eureka MT 59917.





Ray's shop is on the second floor of a small (15' x 15') cabin he and his wife Shirley lived in when they arrived on the 80 acres they occupy outside of Eureka, Montana. They've since built a larger (20' x 20') log cabin. Both are powered by generators and solar panels. Ray chooses between 3 generators in the shop, depend-

ing on which tools he's using. When I came to visit (with my wife and two boys) he thanked us for "inspiring" him to clean up his shop so that there would be room for us during our visit. He said there had been about 35 years of accumulated clutter, materials, and projects, all covered in fine sawdust. "I'm not a neat kind of person," he

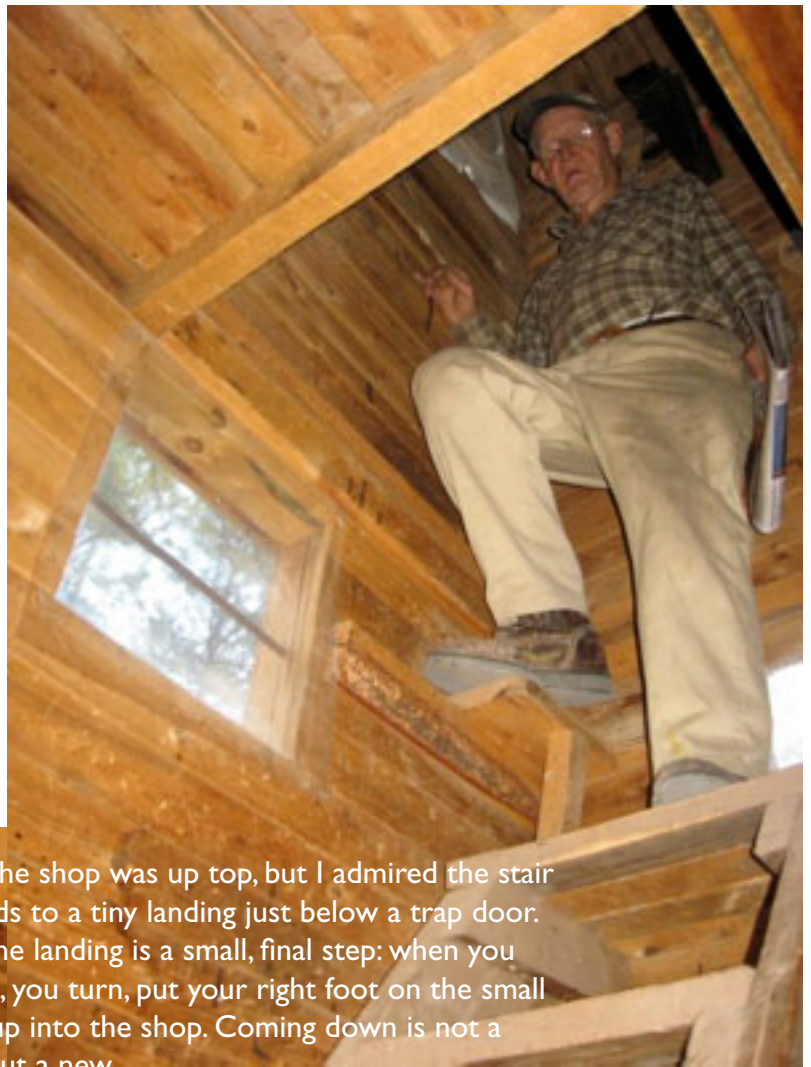
said, tho it was clear that he'd made a place in his tiny shop for everything he needed. Once at work, however, organization takes a low priority, and he loses stuff. "Religiously I'm a hopeful agnostic," he told me while he searched for some tool he'd just put down. "God will hide things from you in plain sight and he won't let you see





‘em ‘til he’s goddamn good and ready — which doesn’t usually happen until I’ve put everything in it’s proper place....”

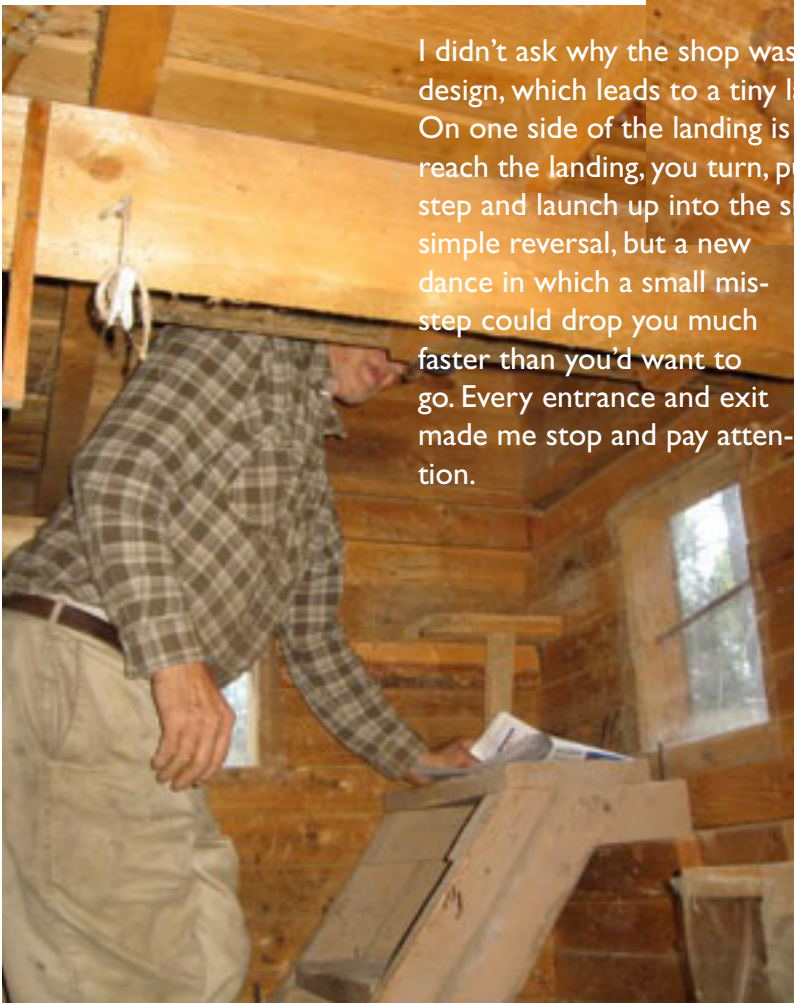
Ray doesn’t believe in perfection. If an instrument comes out too good, he’ll dent it before he lets it go. The particular beauty of his instruments has everything to do with how they sound and how they make music. When he told me that he makes about one instrument a month, he explained that “I don’t aim for that – there’s just things I want to try, ideas I have.” If someone gives him a guitar that’s not-so-good, he wonders if he can make it sound better. I felt a bit disappointed when we finished my dulcimer because I hadn’t gotten the sides glued on straight, but Ray tapped it and pronounced it one of his best because of its tone, volume,



I didn’t ask why the shop was up top, but I admired the stair design, which leads to a tiny landing just below a trap door. On one side of the landing is a small, final step: when you reach the landing, you turn, put your right foot on the small step and launch up into the shop. Coming down is not a simple reversal, but a new dance in which a small mis-step could drop you much faster than you’d want to go. Every entrance and exit made me stop and pay attention.

and brightness – all of which were partly craftsmanship, but also a particular combination of proportions and materials – a piece of fir from an old, slow-growing tree that had been cut just right by an unknown sawyer in an unknown mill – things he can’t prescribe exactly because every tree has its own characteristics – growth rate, density, soil. These things come as gifts; as was the idea to use cardboard, which came to him when he noticed how nice it sounded when tapped.

There’s more about Ray and this book at the end. Let’s make an instrument.



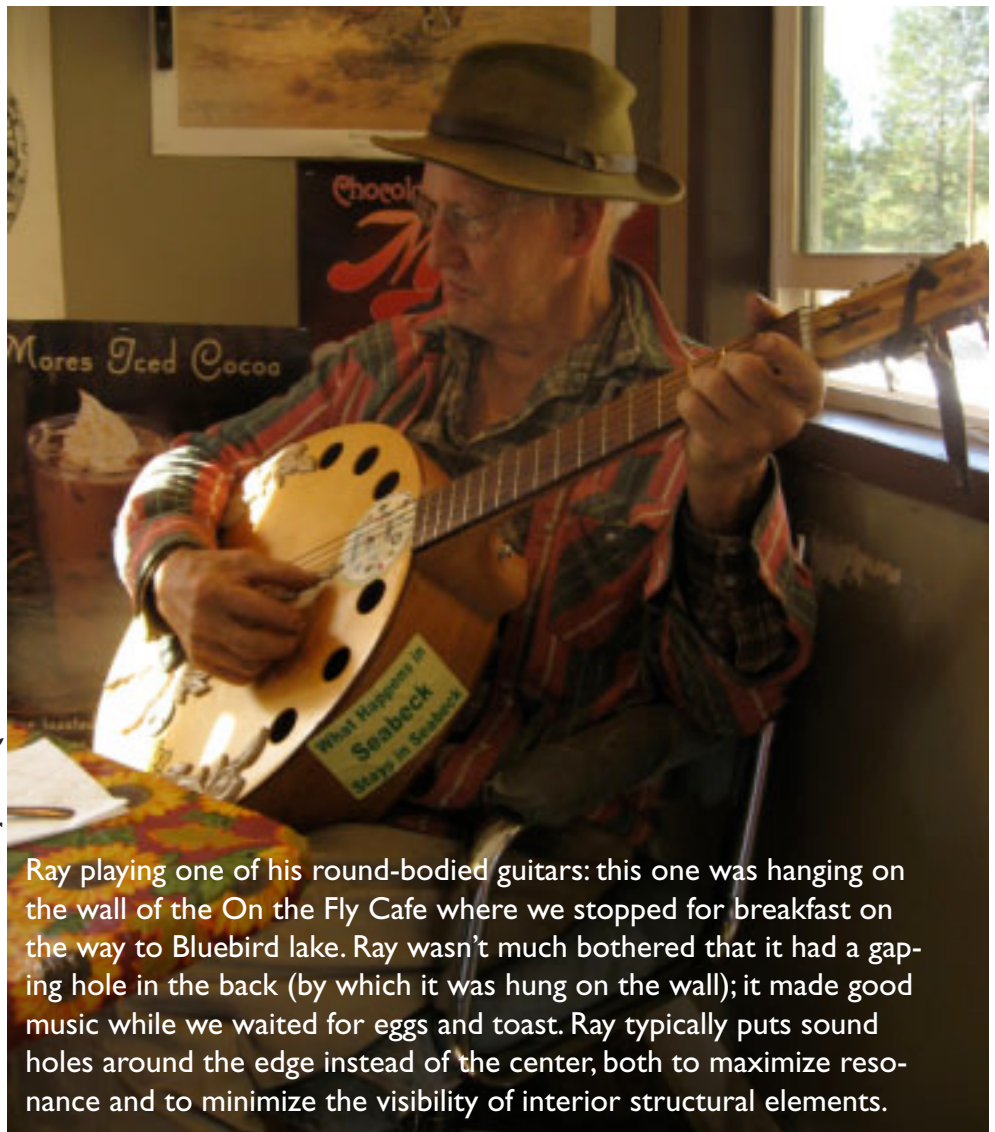


## TOOLS & MATERIALS: WHAT YOU'LL NEED

You don't need a whole wood-shop like Ray's, or a lot of power tools. Any hand tools you may need to buy will have multiple uses and are worth learning to use. Good hand tools will serve you well for a long time. Most should be easily obtainable used in your local thrift or "re-store", or at yard sales. If you already have a wood-shop or a tool-kit, you likely have all you'll need.

### TOOLS

- Hammer (a regular 16 oz, smooth-faced "finish" hammer is fine; don't get a heavy framing hammer with a textured face.)
- Hand saw (I recommend a dual-purpose, Japanese-style "pull saw" with "rip" teeth on one side and "crosscut" teeth on the other, but a conventional push saw will work fine also – Bahco makes the best ones.)
- coping saw with fine-toothed blades (10 or more teeth per inch)
- small (12") adjustable carpenter's square
- metal file (it should be as perfectly flat as possible; Ray says it's worth comparing files before you select one. Take a straight edge and lay it on the file to make sure it's not cupped or bent. It's also worth getting a new one, as used ones are usually



Ray playing one of his round-bodied guitars: this one was hanging on the wall of the On the Fly Cafe where we stopped for breakfast on the way to Bluebird lake. Ray wasn't much bothered that it had a gaping hole in the back (by which it was hung on the wall); it made good music while we waited for eggs and toast. Ray typically puts sound holes around the edge instead of the center, both to maximize resonance and to minimize the visibility of interior structural elements.

- so worn and dull as to be nearly useless.)
- wood rasp with one rounded and one flat side, and both coarse and fine teeth
- drill and bits (electric or hand-drill)
- a set of small round "twist" bits (1/6" - 3/8")
- a set of larger, flat "spade" bits (1/4" - 1")
- wire nippers
- pliers
- clamps – at least 2, and up to 6. These can be old-style threaded or the new

- "pistol grip" style. It's also handy to have a few spring clamps of various sizes from small to large.
- a vice is helpful and worth having, but not strictly necessary, as you can improvise with a clamp or a hammer and a hard (metal) surface.
- razor knife (sharp!)
- a hacksaw blade (the handle isn't necessary for this project, but is worth having)
- cabinet scraper (if you have a grinding wheel



and/or saw with a metal-cutting blade, you can make one of these from an old sawblade)

- a reliable straight edge at least 30" long (this can be a metal yardstick or anything with a long and truly straight edge)
- screwdrivers, including Phillips head #1 and #2, as well as bits to fit the kinds of screws you buy (see below)

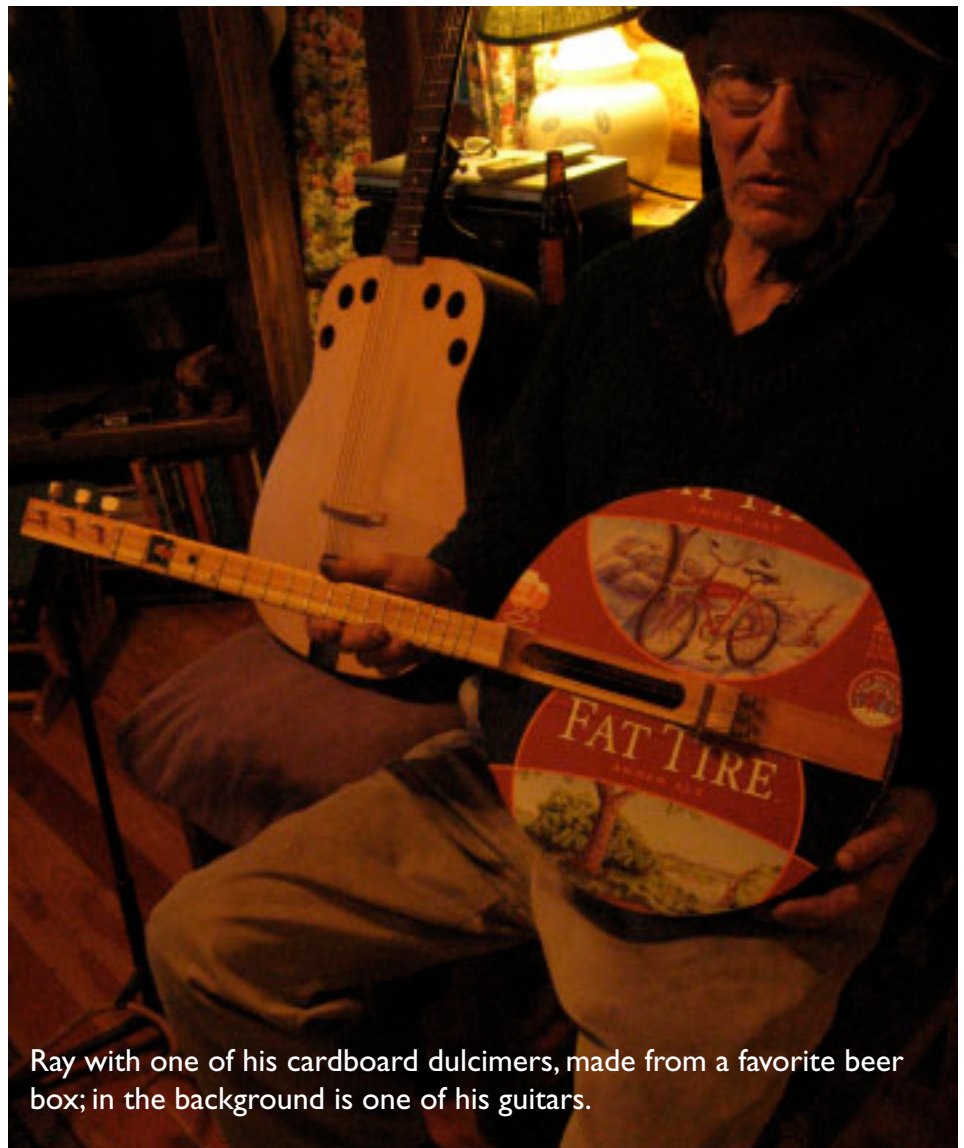
## TWO LAST TOOLS & A

**NOTE** on getting by without

- Jack plane (with fully adjustable blade)
- Sharpening kit for the plane (options vary, but single sheets of sandpaper from 100 to 600 grit will do fine.)
- NOTE: The plane just insures the flatness of your fretboard, but you won't need it if you select a piece of wood that's already flat; or if you ask a woodworker to run it through a jointer. You could also flatten it with sandpaper and a block.

## NECESSARY SUPPLIES & HARDWARE TO BUY, BEG, BORROW, OR SCROUNGE

- sandpaper, at least one sheet of 80 grit; if you want to get fancier/smoothier, add finer grades up to 220 or so...
- Yellow carpenter's glue
- hot glue gun
- ½" brads, 17 or 18 gauge
- Aleen's "tacky glue"



Ray with one of his cardboard dulcimers, made from a favorite beer box; in the background is one of his guitars.

(you can make do with yellow or other glue)

- sheetrock or sheathing screws – the shaft below the head should be free of sharp thread that might cut a string; get three no. 8 x 1¼" and two no. 8 x 1½" (either Phillips, square, or "star" drive screws – and driver bits to match)

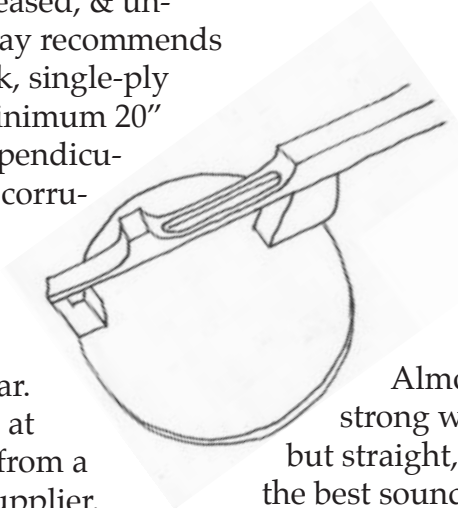
## DULCIMER MATERIALS & HARDWARE

- ½" plywood, 4 or 5 layer, one side finish sanded (also known as "carpet grade" – this stuff is manufactured in 4 x 8 foot sheets, but all you need is a piece about 14" x 28" – you don't need to buy a whole sheet; ask a lumber yard, builder, or job site for scraps. Avoid pieces with vacant spots in the middle layers (tap the piece and listen for hollow sounds). 1/8"



thicker also works.

- Fir, larch, spruce, or lodgepole pine, "two-by" stock at least 34 inches long, straight and "kiln-dried" or well-seasoned. Very often, the best wood is old lumber from buildings built when forests were still full of straight, old, slow-growing trees. You'll need a narrow strip a bit thinner than it is wide, cut from the straightest side, and another, shorter strip about 1½" thick.
- Cardboard: fresh, flat, dry, uncreased, & unwaxed. Ray recommends 1/8" thick, single-ply board; minimum 20" long (perpendicular to the corrugations).
- Three tuning pegs, as for a guitar. Available at stores or from a catalog supplier. Ray recommends (and the design here specifies) Stewart MacDonald tuners, "economy 3-on plate machines," item no. 0934, which cost about \$9 for a single set in Sept. 2012, and can be simply re-manufactured for better performance. If you don't want to bother re-manufacturing, however, and don't mind extra cost, get the best you can afford. You want ¼" diameter



posts, spaced about 1-3/8" apart. See photo. Stewart MacDonald, 21 N. Shafer St/Box 900, Athens OH 45701, 800-848-2273; stewmac.com.

- Three strings:
  - 0.012 unwound guitar
  - 0.020/.022 banjo wound 4th string,
  - 0.032 wound guitar 4th string (light)
 Ray orders from Euphonon Co., POB 100, Orford NH, 03777, 888-517-4678.



Ray made his bandsaw 35 years ago, from a kit

## STEP 1: THE NECK

### MATERIALS

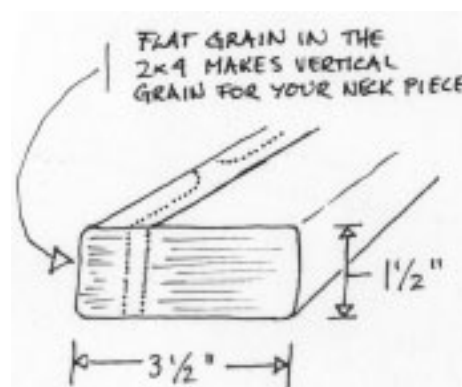
Almost any reasonably strong wood will work, but straight, tight grain gives the best sound. Grain should run flat in the board, so when you cut your neckpiece (see below), the grain will run vertical. Wood type determines instrument strength; quality and spe-

cies determines tone, the speed of response, and loudness.

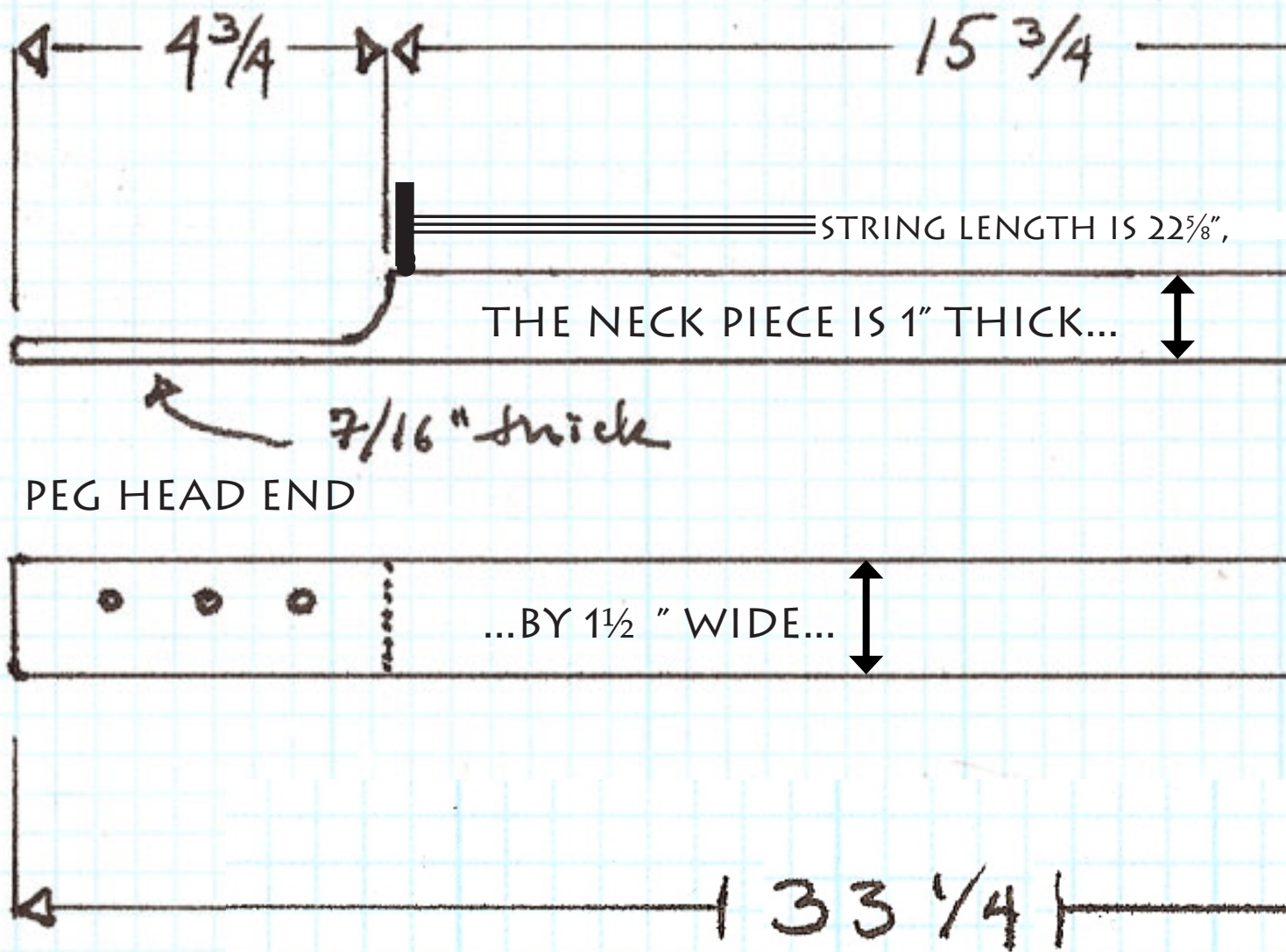
Jared, on the cover, used the top of a dead fir tree (tho this required him to plane a flat surface later for the fretboard).

Ray's neck dimensions were just "what seemed appropriate...a compromise between good sound and ease of playing."

The illustration on the next page shows basic dimensions, as well as the rough location of the bridge (which stops string vibration near the sound hole) and the nut (which does the same at the other end). Nut and bridge define string length, which determines the location of frets, or notes. More about this when we get to the frets.







## NECK DIMENSIONS

**TOTAL LENGTH** =  $33\frac{1}{4}$ "

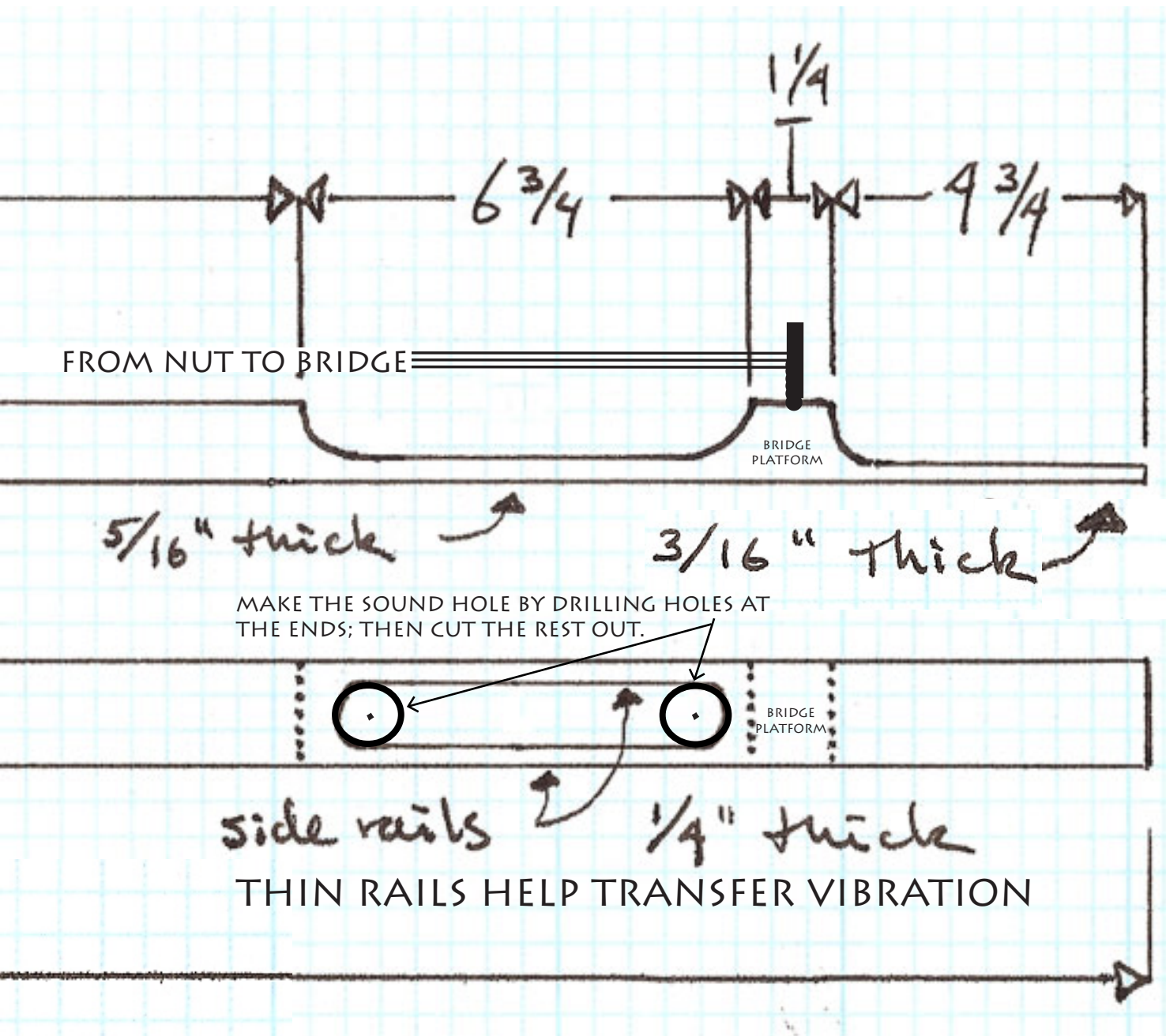
**WIDTH** = 1.5" (the thickness of a standard "two-by-four" — tho if you have to plane or sand it flat and straight, it may be a bit thinner)

**THICKNESS** = approx. 1" to  $1\frac{1}{4}$ " — thicker for weaker wood, thinner for stronger wood.

**PEG END THICKNESS:** finish sand to  $\frac{7}{16}$ "

**SOUND HOLE:** The sound hole is as long as possible to maximize vibration. Finish sand the rails to  $\frac{1}{4}$ ", it's OK if they come out a hair thicker or thinner). If you have no sander, the rounded transitions from thick to thin can be square, but you can also round them by hand with a rasp, file, or knife. Do whatever seems best/most attractive to you.)





If you're not comfortable transferring the dimensions directly onto the wood, draw your pattern on a stiff piece of paper, and cut it out with scissors. When you set your pattern against your neck piece, look for knots or blemishes in awkward places and arrange your pattern to avoid them.

The top (fret side) must be *straight & flat*; if not, you'll have to file them all flat and uniform; also, if the distance between fret and string isn't uniform, strings will buzz.

Assuming you've found a good, straight piece of lumber, you can use the existing milled edge for the fret face, and smooth the cut side with a jointer, hand-plane, or sandpaper on a wooden sanding block



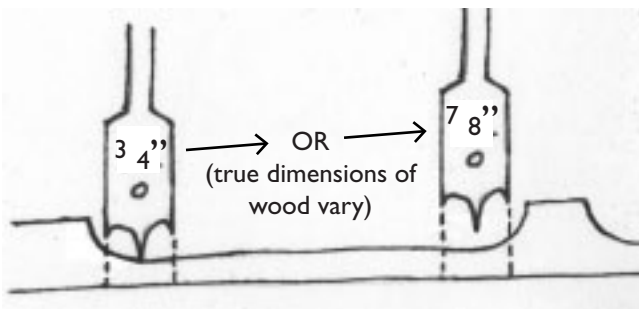


For producing large numbers of dulcimer kits, Ray uses a 60 grit rubber sanding drum, 2" long x 1.5". This make short work of finishing the ends of the sound hole, but you can also finish them with a half round rasp, chisel, or knife, or a straight saw cut.

When you drill the holes for the sound board, the middle of the hole should be located at the point where the wood reaches it's final thickness.



Here, Ray is using a vertical belt sander to thin the tail of the neck board. Again, something you can do by hand with a rasp, sandpaper, etc.



To cut out the wood between the holes, draw lines on the bottom of the neck and cut from the bottom, so your jig saw has a flat surface to rest on. Ray uses a jig saw with a fine-toothed metal-blade or, if he only has a wood-cutting blade, he'll grind the sides flat to remove the "set" off the teeth; this allows a smoother cut.





If you don't have an electric jig saw, cut the holes with your coping saw by removing the blade, threading it through the hole, and then re-installing it into the saw handle; clamp the piece firmly and cut the rails a bit thick so you can use your file to make them straight and smooth.



In the bottom photo here, Ray finishes the sides of the sound hole with a "Shinto rasp." A wood file or fine rasp would work, too.

The narrow rails of the sound hole vibrate with the strings and the instrument top, and so help to maximize vibration, volume, and the quality of the sound.





## STEP 2: LOCATING FRET SLOTS

If you get the frets wrong, you'll end up with notes that won't sound right. So Ray uses a razor knife and another neck as a template to exactly transfer precise marks to the new neck. The fret chart on p. 15 gives precise measures for marking the frets on a single instrument, as well as some background on why the frets go where they go. But for production it's worth making a template that you can use as pictured. Make sure to center



the blade in the slot, then cut down to set the mark.

Once you've marked the edge of the fretboard, use a square to extend the mark across the full width of the fretboard. Set the knife in the mark, and then hold the square against it. Be sure the blade doesn't wander or pull away from the square edge.

The last fret before the tuning pegs is the nut, which stops vibration and defines the end where you measure string-length from. Guitars often have bone or plastic nuts, with slots cut for the strings, but Ray just uses fretwire and sets two small brads to align the strings.

"I trained one teacher to make kits, and supplied another with kits I'd made." Ray asked his own students to pay \$25 for the kit (this was between 1976 and 1991), with some kits donated so that all could play if they wanted to. "This is an idea to be in all the schools."





## CUTTING FRET SLOTS

You need to cut slots in the neck that will fit snugly around the thin fret wire. You could buy a special, fancy “fret saw,” or you could follow Ray’s example and modify a coping saw by hammering or grinding the “set” off the sides of the blade, and thinning the back edge to keep it from binding in the cut.

Cut the slots carefully, so the blade is in the mark and follows it faithfully; cut evenly so the slot goes down the right depth (the blade width, or about an eighth of an inch).

**ALTERNATIVE FRETS:** Ray has used heavy duty staples as frets, for some less expensive instruments. He would use two half inch “crown staples” to make each fret, but he says you can’t file them too much or there’s nothing left. (Lots of cigar box guitars play fretless, with some kind of “slide,” or fiddle style. In the olden days, frets were adjustable loops of string tied around the neck, and replaced as needed. Some folks say Bach screwed it all up when he “tempered” the scale and made it standard.)



# GET YOUR FRETS IN PLACE!

Frets divide the neck of your instrument into segments that we know as notes. Guitar fret boards typically include all the half-steps, but dulcimers only include two half-steps, which means fewer frets and a simpler instrument to learn.

I know little of music theory, and I'd never built a stringed instrument. When Ray started cutting slots for the frets I suddenly realized I was witnessing a mystery: who figured out where the frets should go? What's the magic formula? And why?

If you're not interested in such questions, just use the precise fret measures, or find an old neck from a guitar of the right string length, and skip the rest.

But there's beauty in mystery: Ray explained that a plucked string will play the same note at half the length of the string, but at a higher pitch. In Western music, we divide the octave into 12 steps; the 12th dividing the string exactly in half. So frets are spaced according to the "rule of 18" by which each half step is  $1/18$ th of the string length to that point (actually, the precise number is 17.817). Fret spacing varies according to string length, but guitars, ukeles, etc., all follow the same rule.

After fruitlessly searching the web for explanations of *why*

frets are the way they are, I went into my local guitar store and asked them. One guy pulled out Hideo Kamimoto's *Complete Guitar Repair*, which shows the graphic illustration of the rule I've offered here — but he still didn't explain why. So far, I've learned that strings behave differently according to density, and that frets themselves constitute a western, industrial kind of standardization, like time zones and dictionaries, that some people blame for killing inspiration and creativity and imposing dead rules and standards. If Yehudi Menuhin, Alison Kraus and all those other famous folk can play fiddles without frets, why not fretless dulcimer too?

The chart on the opposite page shows the fretboard, with the nut on the left and the bridge on the right (betwee these two points, the string can vibrate freely so music can happen). Now divide that length by the magic number. This gives the distance from nut to first fret. Now draw a perpendicular line at the left end and mark it at the same distance as the first fret. Draw a line from there to the other end of the fret board — call this the tangent. Draw a perpendicular line from the fretboard to the tangent. Center a compass at the first fret mark; adjust the other leg to meet the mark at the tangent; swing an arc to the fretboard; continue

until you have as many marks as you need frets.

It's best to do this at full scale. In fact, it makes sense to mark your actual neck board; also make sure the 12th fret coincides with half-way mark. If they don't, something's off (not hard to do).

## PRECISE FRET MEASURES

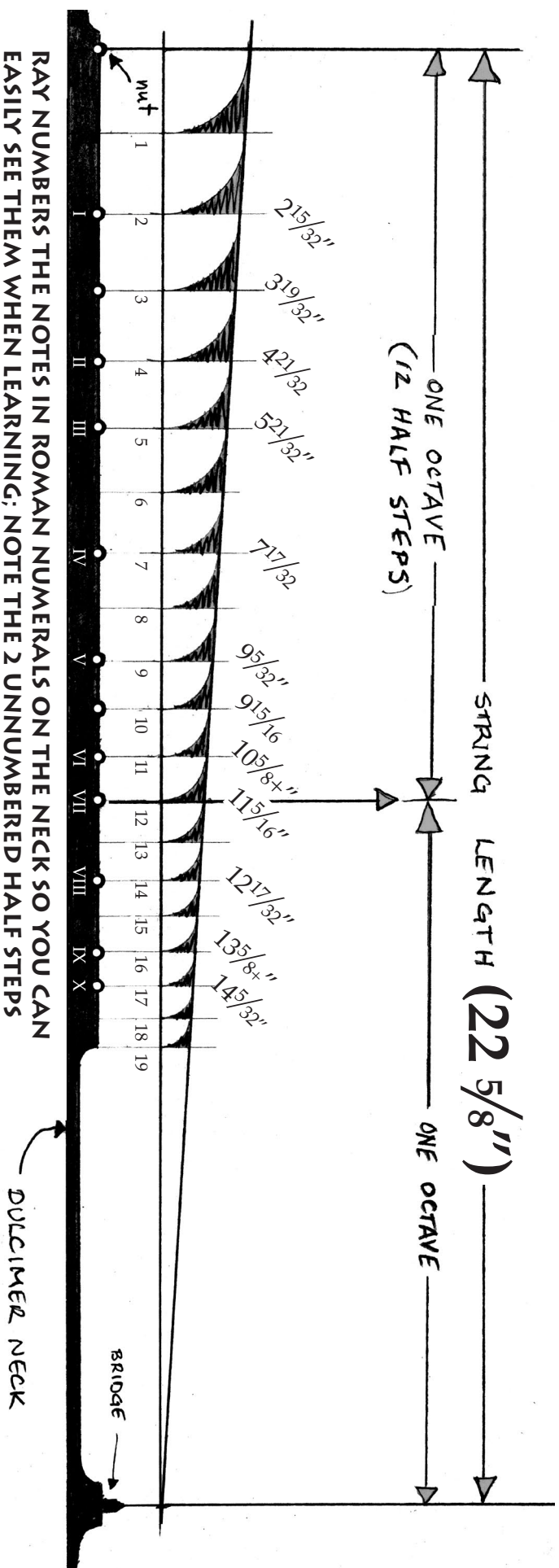
To minimize possible errors, all measurements are from the the middle of the nut fret to the middle of the actual fret (NOTE: if you use a typical nut with a flat top, string vibration (thus length) begins at the edge of the nut, not the center). Use a sharp knife for accurate, precise marks.

A plus sign (+) indicates an extra  $1/64$ ".

INCHES DECIMAL	FRET NUMBER	INCHES FRACTION
2.47"	I	( $2^{15}/32$ ")
3.60"	half	( $3^{19}/32$ ")
4.67"	II	( $4^{21}/32$ ")
5.57"	III	( $5^{21}/32$ ")
7.53"	IV	( $7^{17}/32$ ")
9.17"	V	( $9^5/32$ +")
9.93"	half	( $9^{15}/16$ ")
10.64"	VI	( $10^5/8$ +")
11.31"	VII	( $11^5/16$ ")
12.55"	VIII	( $12^{17}/32$ +")
13.65"	IX	( $13^5/8$ +")
14.15"	X	( $14^5/32$ ")



# THE FRET CHART



## USING THIS CHART

The bottom bar is your dulcimer neck w/ exaggerated fret "bumps" and Ray's Roman Numeral scale; number VII (7) is the 8th note of the octave, since the string alone is a note).

The small arabic numbers indicate the progressive compass arcs for all the half steps on a conventional guitar. You'll draw 17 of them, but you'll only actually install 10 frets.

The slanted numbers are the actual measure from the center of each fret to the center of the nut.

*Go slow, be careful, pay attention!*





## PREPPING FRETS FOR GLUEING

Fret wire is round with a straight “tang” to fit into your fret slot. Little barbs texture the tang to help it grip the wood. Some wire has more barbs; some has less. Ray says the more the better, especially when putting frets into soft wood. He gets guitar (not mandolin) fretwire from Euphonon Company, out of Orford, NH — it has barbs every 1/8”.



Secure the fingerboard in a vise or on a flat surface, as you’ll be tapping the frets in place with a hammer. If you use a vice, you’ll only be able to do a few frets at a time. Spread a bit of glue into the slots, about three or four at a time (Ray gets his neat little glue applicator from Woodcraft).





Remove excess glue with a finger, as it can interfere with your final finish — a hardwood fingerboard may need no finish, but softwood soaks up grease and dirt.)



To make sure you've got the surface completely glue-free, use a scraper to remove the last residues.





## GLUEING THE FRETS IN PLACE

Set the fret wire carefully, as it can easily jump out of the slot or wander off line. If it does, fill any unintended dents in the wood and re-cut the slot). The fret wire should be level all the way across, but it's easy to tap the ends down too far, so go slow. It's also easy to crush the wood at the edge. Frets should be tapped in completely, but no more.

Start hammering at the far end and work back.

Cut each wire after you've tapped it in place. Don't worry too much about the precision of the cut, as you'll be filing the frets to match the width of the fretboard, and to make sure you can move your hand smoothly up and down.





## DRILL HOLES FOR STRING ANCHORS

While you wait for the glue to dry on the frets, pre-drill three holes for the string anchors. Use a bit slightly narrower than the screw, and go in at about a 30° angle, as illustrated:



## FILING THE FRETS

You file the frets to keep an even distance between string and fretboard. If you didn't, the strings would buzz against the high bits of fret. When they're all evenly on a single plane, you get nice, clear notes.

Check first to see how flat the frets lie. Set a straight edge on them. Any rocking in the straight edge will indicate a high spot. That's where you want to start filing. (Note that Ray has bent the handle tang on his files to get his hand up higher, which makes fret filing easier.)



DON'T file the "nut," which is the last piece of fret wire. That one should be a bit "proud," or high, to stop the vibration of the strings at the end of their length.

All the frets should be filed. The filed face of the fret doesn't have to be very wide, just make sure the file has hit it.

Check to make sure the nut stands "proud," higher than the others, and that the entire surface is flat.







## FRET ENDS

To make the whole neck as smooth as possible for fingering, file the ends of the frets at about 45°, until the file hits the wood, then a couple of swipes more to round them. Do this to the nut, too.

Remove any burrs from the edges of each fret end. Remove sharp edges from the flats, too. This requires a bit of care with a regular flat file; you can also use a small sharpening stone, a special fret file, or an automotive point file.







## INITIAL SHAPING OF THE NECK

Marking and then cutting the edges on the bandsaw

You can also do this w /hand tools: rasps, files, spokeshave, drawknife, knife, etc.





# TIME FOR A BREAK!

## RAY PLAYS HIS

### CARDBOARD FIDDLE





Here are a couple of Ray's other instruments: a triangular fidde with a more traditional look, and a banjo built from a gourd.



Shirley Jacobs, photo

Vibration from the strings gets into the soundbox through the connections at the top and bottom of the gourd, and through the bridge (a piece of brazing rod), which sits on posts attached directly to the cedar top. Shirley did the decorations.







Jon Crandell, photo



Jon Crandell, photo







Musicians in Madagascar,  
photos courtesy of Smith bros



Jared Smith (below, L) was the first person to build a dulcimer from this book. He said, "The neck started out as a round doug fir pole, that I attened a face on using chisels, drawknives and a hand plane — no power tools at all! I used a 1-1/2" nail as the nut, three different tuning pegs from the local guitar repair shop, and gorilla glue to hold it together. Other than that, I stuck to the instructions."

Jared later told me about this home made guitar that his brother John got in Madagascar from the boy who made it. He traded the boy his own fancy commercial travel guitar. The body is carved out of one piece, covered by a thin top with a soundhole. The strings are fishing line and bike cables. One broke due to rust, but the boy had apparently planned for that; a few days after he gave John the guitar he tracked him down and gave him a few extra cables (you can see them wrapped up around the headstock of the guitar). It has tapered wooden tuning pegs that actually work remarkably well! For even more wonderful hand-made inspiration, look up sothosounds.org, and "landfill harmonic" on Vimeo.



### STEP 3: MAKING THE PLYWOOD BACK

The back of the dulcimer serves two purposes: it reflects sound waves back out the front, and it gives the instrument structural strength. For strength, it's helpful to have a wooden edge to protect the cardboard sides, but in order to have a wooden edge, you'll need special tools to make a channel around the perimeter of the plywood where you'll glue the cardboard. If you don't have those tools, you can simply glue the cardboard directly to the wood, and just handle it a bit more carefully. Or reinforce the edge with leather, duct tape, etc.

#### MATERIALS

Plywood: ½" thick, preferably 5-ply. Look for Douglas fir or larch ("it's gettin' harder to git.") Depending on how much you want to spend or scrounge, you'll need to decide on higher grade stock that's sanded on one (or both) side(s). Look for a piece that has as few knots as possible (mostly for looks).

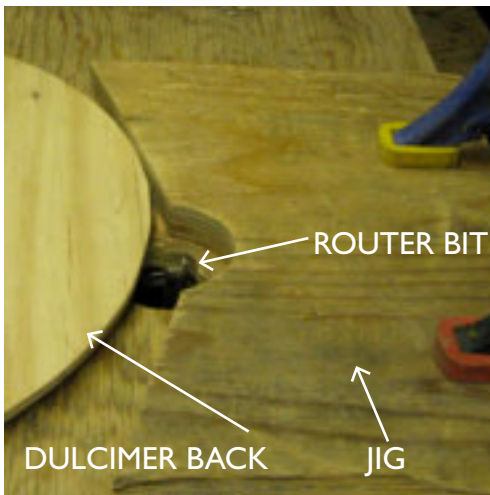
#### DIMENSIONS

For the simpler version, with the cardboard glued straight to the wood, make a plywood circle 12-7/8" in diameter. Mark the center on the surface that will be the inside of the instrument, and leave the center mark showing for future reference. Use a jig or coping saw to cut the piece. Make sure the finished edge is nice and flat and square and smooth.

If the plywood has two rough faces, like this piece, use the rougher face on the inside. To make a better glue joint for attaching the neck, just sand smooth spots on two opposing sides of the circle (go with the grain).







### OPTIONAL: ROUTING A GROOVE FOR A SOLID EDGE

This gives a solid wooden edge to your instrument, which will hold up better than cardboard. If you don't have a router, reinforce the cardboard with a strip of leather or cloth tape around the edge, or just fill the bottom corrugations with glue.

If you do go the router route, cut your plywood circle  $13 \frac{3}{8}$ "



diameter. Ray uses a routing table with a jig (see photos) to make a cut  $\frac{1}{4}$ " deep and  $\frac{1}{4}$ " wide. This way, he can use thick, two-ply cardboard sides, and have a little extra plywood left over, which can be sanded down later or left as is. With neck blocks cut  $1 \frac{3}{4}$ " thick, you'll end up with a 2" deep body

made of 2" wide cardboard.

Ray prefers single thickness cardboard, but he says it's hard to find single-ply board that's strong enough, and the double ply stuff gives you a wide gluing surface for the top. If you do find some thin stuff, cut your channel accordingly shallower.

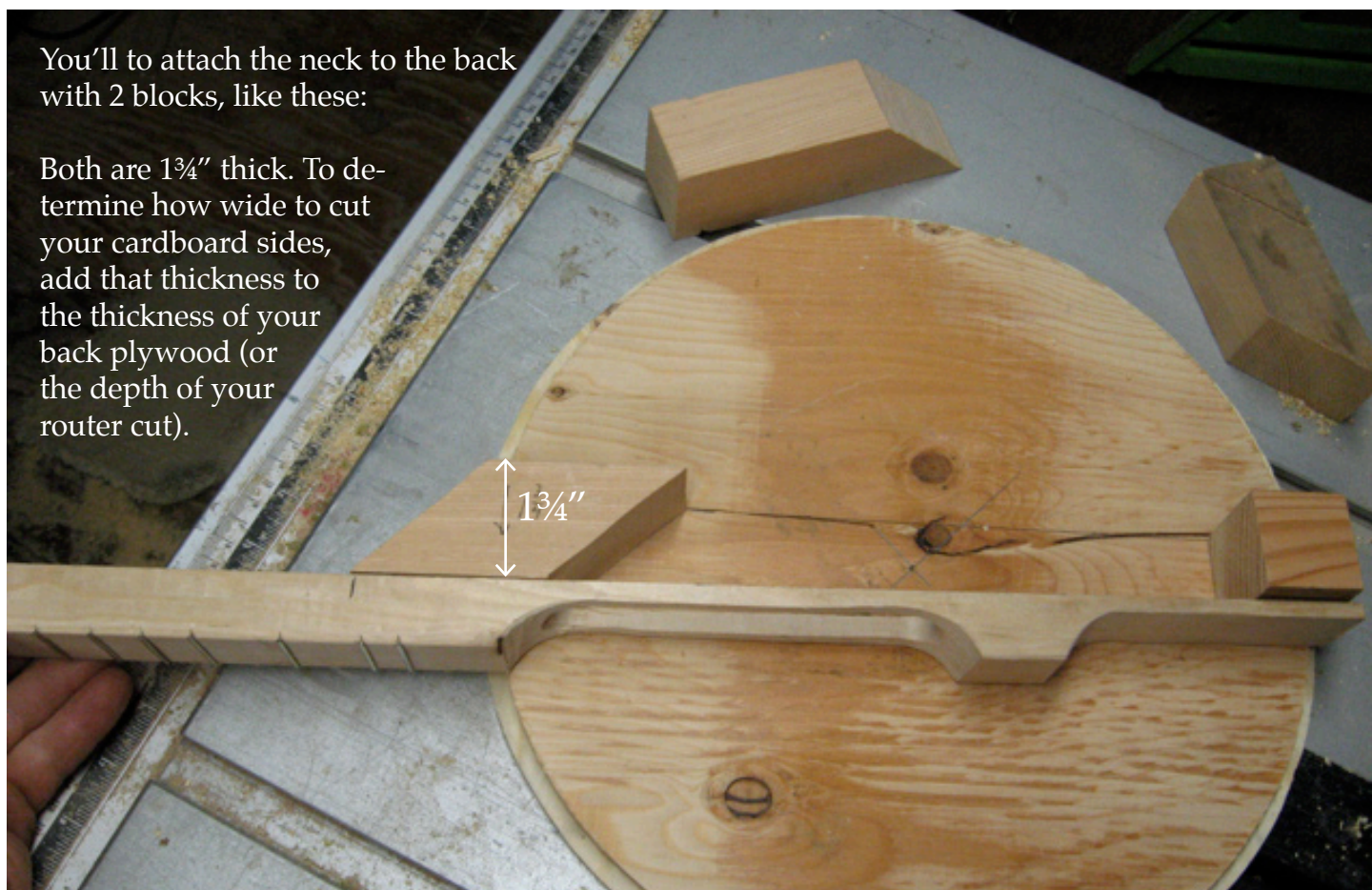


If you don't rout a channel, you're probably better off using any kind of single ply cardboard (it will wrinkle less), and adding a thin strip along the top edge, to make more gluing surface. Cut it  $\frac{1}{4}$ " wider since you'll want to glue it to the full thickness of the  $\frac{1}{2}$ " plywood.

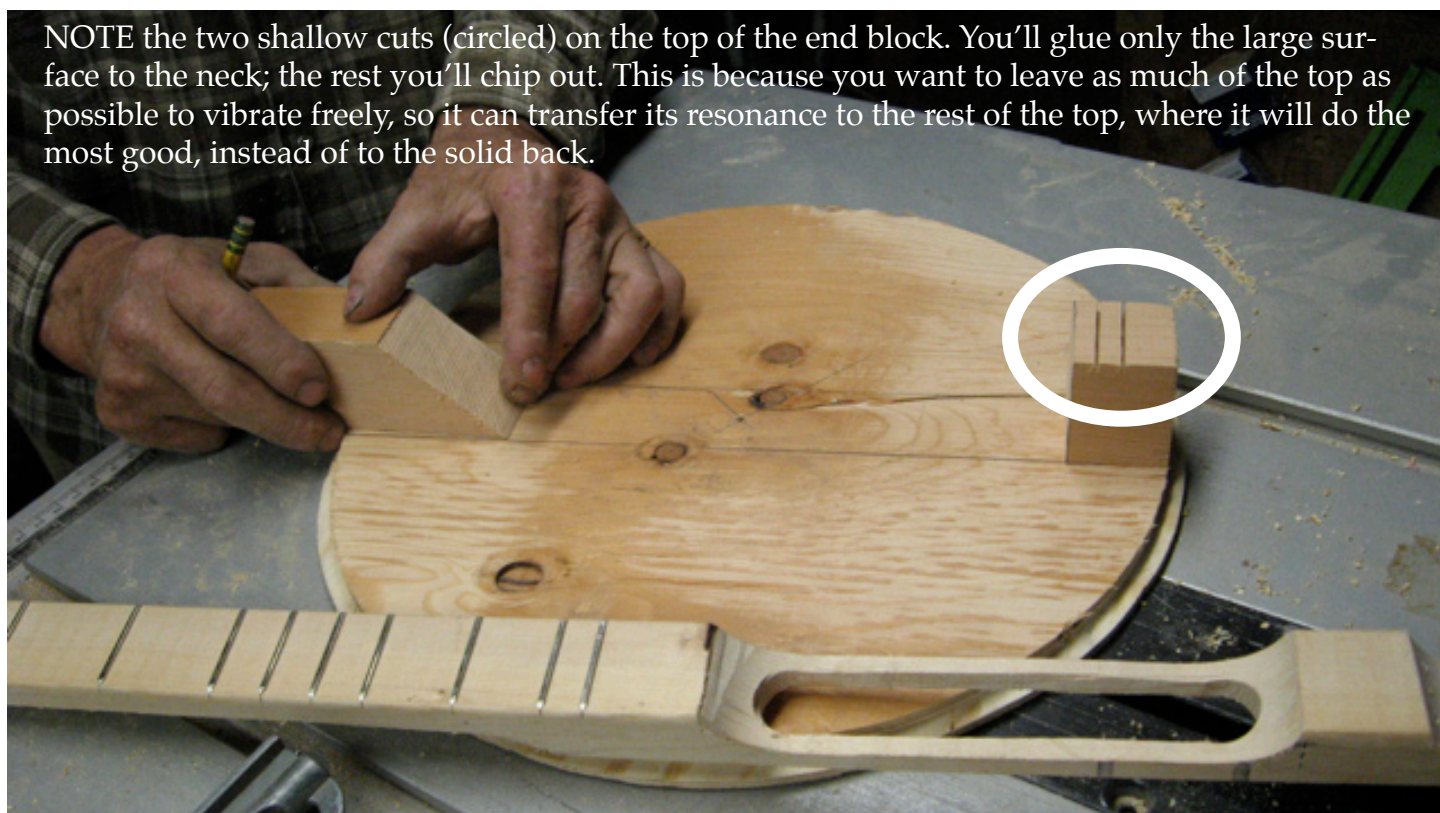


You'll to attach the neck to the back with 2 blocks, like these:

Both are  $1\frac{3}{4}$ " thick. To determine how wide to cut your cardboard sides, add that thickness to the thickness of your back plywood (or the depth of your router cut).



NOTE the two shallow cuts (circled) on the top of the end block. You'll glue only the large surface to the neck; the rest you'll chip out. This is because you want to leave as much of the top as possible to vibrate freely, so it can transfer its resonance to the rest of the top, where it will do the most good, instead of to the solid back.





## CUTTING THE BLOCKS FOR ATTACHING THE NECK TO THE BACK

**BLOCK SIZE:**  $1\frac{3}{4}$ " (a taller block will deepen the sound, a shorter one will make it higher; Ray says you don't want to make the soundbox much shallower, tho...)

For placing the neck and block assembly, center the neck on the back and draw guidelines on both sides.



The cardboard sides will be as wide as the block height, plus the back depth. Cut the cardboard accordingly:

with routed groove:  
 $1\frac{3}{4}" + \frac{1}{4}" = 2"$

without routed groove:  
 $1\frac{3}{4}" + \frac{1}{2}" = 2\frac{1}{4}"$



These measurements are crucial because the top will need to match up precisely with the rails that define the edges of the sound hole.

The slanted block must not block the vibration of the rails that make the sound hole. Place the neck and blocks in position; mark the back of the block and cut the second slanted face to meet the edge of the plywood circle (in this case, the inner edge of the router cut).







## GLUEING BLOCKS TO BASE

The slanted block will be clamped and screwed. Position the piece and drill a pilot hole. The day we made this one Ray said, "There's a better way but I'll do it this way." The better way would be to fix the block temporarily while drilling, but the quicker way worked fine.



Apply glue sparingly, to minimize any excess from squeezing out the sides.



Line up the blocks with your guidelines and clamp in place; take care that the blocks don't slide out of place on the slippery glue. The end block needs no screw, but you do need the full face to ensure even clamping. After the bottom is glued up, you can chip out half of the top surface.



## GLUEING NECK TO BODY

Again, only the slanted block gets a screw, this time from the top. The clamp helps align the neck piece to the block.

Did you remember? Chip out the top of the end block before you glue up the neck (carefully)!



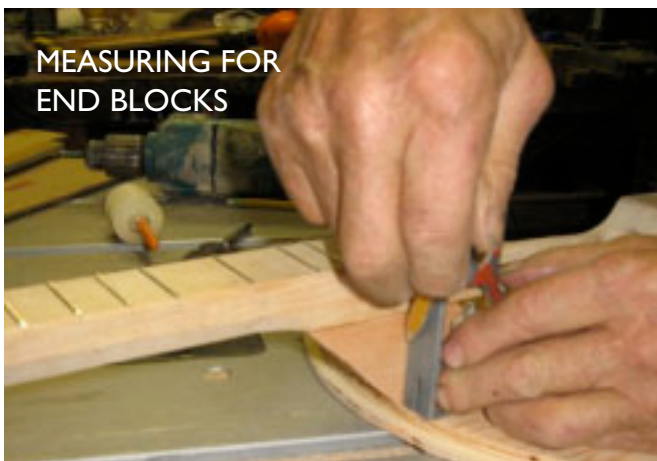
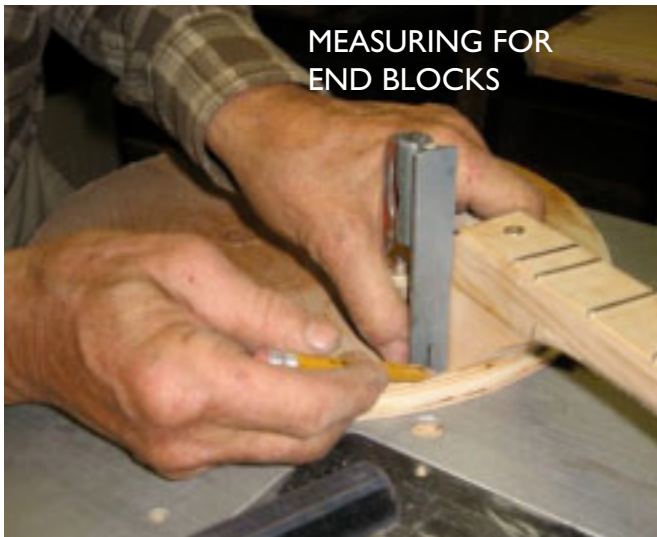


## CUTTING BRACE BLOCKS FOR THE CARDBOARD

Cut 3 kinds of blocks, of any kind of wood:

1. "shelf blocks," for attaching cardboard top to the sides of the neck (you want the whole top to vibrate). These should be small and thin, about  $\frac{3}{32} \times \frac{7}{8} \times \frac{1}{2}$ .
2. "end blocks," for attaching cardboard sides to the front sides of the neck. Approx. dimensions:  $\frac{5}{16} \times 1\frac{7}{16} \times \frac{9}{16}$ . Adjust the longest dimension so that the top of the block comes just a hair short of the top of the cardboard sides.
3. "temporary blocks" serve to brace the cardboard sides straight up during glueing. They should come no higher than the cardboard sides, approx.  $1\frac{1}{2} \times 1\frac{1}{4} \times 1\frac{1}{2}$  (the ones shown here are much narrower because that's what came to hand).

The rest of the photos here show Ray placing the shelf blocks and temporary blocks, and marking where the end blocks will go.







Here you see the shelf and end blocks glued with yellow glue and clamped in place. Ray cements the temporary blocks with a glue gun because it allows for relatively easy removal (bottom photo).





Here you see the location for chord notations. Ray burns these on with a standard wood-burning tool, and a special piece of copper pipe in a wooden handle — this last tool he heats with a propane torch. The notations provide an easy reminder for the basic chords.



#### **STEP 4: SELECTING & CUTTING CARDBOARD**

Cardboard comes as single-ply and double-ply, both in various thicknesses. Ray prefers 1/8" thick, single-ply cardboard, (the thinner stuff is about 3/32" and will work, but it needs bracing; the double thick stuff is also OK for the sides (not the tops), but harder to bend. If you didn't rout a channel, you're probably better off using any kind of single ply cardboard (it will wrinkle less), and adding a thin strip along the top edge, to make more gluing surface. Cut it 1/4" wider since you'll want to glue it to the full thickness of the 1/2" plywood.

Typically, cardboard will be smoother on the side that doesn't show the corrugations. Take that and any lettering or design into consideration when you cut your top and sides.

Cut two rectangles exactly 14" x 7" (a bit longer than the diameter of your plywood back, and a bit wide than the radius).







Corrugations should run the short way for strength.

Cut two side pieces exactly 2" wide (if you've routed your plywood), or 2 1/4". Length will be 21" (a bit longer than half the circumference.) Again, corrugations should run the short way.

Cutting on top of a waste piece of cardboard will help insure a good, clean edge on your cut. It is important to cut straight and clean, with the ends at a perfect 90° angle, so the pieces fit tight when you glue them.

When I asked Ray how and why he started using cardboard for his instruments, he said, "well, I tapped on a piece and I liked the sound."



## GLUEING SIDES & TOP

Ray likes “Aleen’s tacky glue” which looks and works like a viscous version of normal white glue. The thickness fills the corrugations in the cardboard to make a better bond. Other kinds of glue would surely work as well. Yellow glue thickened with fine sawdust might work.

Pre-bend the cardboard sides by drawing them over a hard edge.

Clamp the starting end in place against your end block. The other end goes half way around to the block that supports the other end of the neck. Pre-fit the piece and mark it. Cut it to length, making sure your cut is square.







Here we used a long piece of thin aluminum sheet stock (cut from an old printing plate) to pull the cardboard tight; then we clamped it in place. (If you're glueing cardboard to the full thickness of the plywood, w/out a routed channel, put waxed paper under the work to keep from glueing it to the table.)



When the glue is dry, you can break out the temporary blocks. If they don't break out clean, use a knife or chisel to clean up the surface.



Just before attaching the top, Ray uses a palm sander to thin the end of the neck and maximize resonance; final dimensions are determined by the quality of the wood and what seems like the right thing to do at the time.





## PREVIEW: HOW TO DETERMINE THE PROPER BRIDGE HEIGHT

While we were between steps on the dulcimer, Ray took down this cardboard banjo, which needed a new bridge. To determine the proper height, he used a measuring block with one tapered side which he slid under a metal straight edge until it was the right height above the frets. He says he's known for the low, easy "action" of his instruments, which comes of keeping a short distance between frets and strings. If you don't have a straight edge, you can put a single string on the instrument and draw it taught. The string should be about  $\frac{3}{32}$ " above the top of the fret at the upper end of the scale, but Ray didn't measure. Either way, when you find the right height, mark the tapered wedge where it touches the string or straight edge. That will be the height of your bridge piece.





## STEP 5: LACQUER FINISH FOR THE NECK

After all the sanding is done, we vacuum out the worst of the dust, wipe off the rest with a damp rag, and give the neck two coats of clear brushing lacquer — it stinks! Best done outside with plenty of ventilation.

Don't lacquer along the bottom edge of the neck where the cardboard attaches.





## STEP 6: FITTING THE CARDBOARD TOP

After the lacquer is dry (about 1½ hours), find which edge of which cardboard top piece fits best against the neck. Mark the sides so they don't get mixed up. Hold each piece in place and carefully trace a line about 1/16" from the top edge of the cardboard side. Cut carefully with a very sharp knife.

Use the cut cardboard to make two slightly oversize pieces of wood to clamp over the cardboard.

When you apply the tacky glue, be sure to fill the tops of the corrugations. Ray glues only the edge of the cardboard top, not the rails. Put dots of glue on the three shelf supports. Squeeze glue into the corrugations along the straight edge of the half circle. Press it carefully into place, being sure to push each half circle tight against the neck. Set the clamp boards in place, being sure that no glue squeezes into places where it will glue the clamping boards onto the cardboard. Lightly tighten the clamps, or hold with gentle pressure for ten minutes.



Be sure not to glue the clamping boards to your instrument! Back them off the neck at least 1/8".



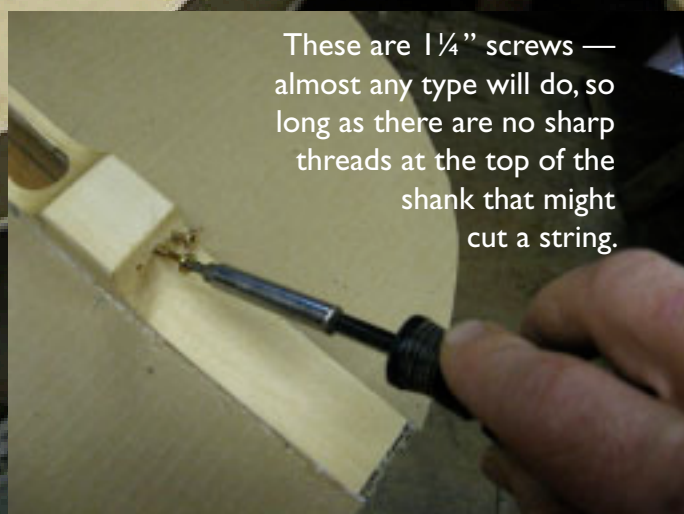


HEY! SOUNDS GOOD!

Ray points out that hi-end speakers are made from cardboard. The proof is in the sound box...



INSTALL ANCHOR  
SCREWS FOR THE  
STRINGS



These are 1 ¼" screws — almost any type will do, so long as there are no sharp threads at the top of the shank that might cut a string.

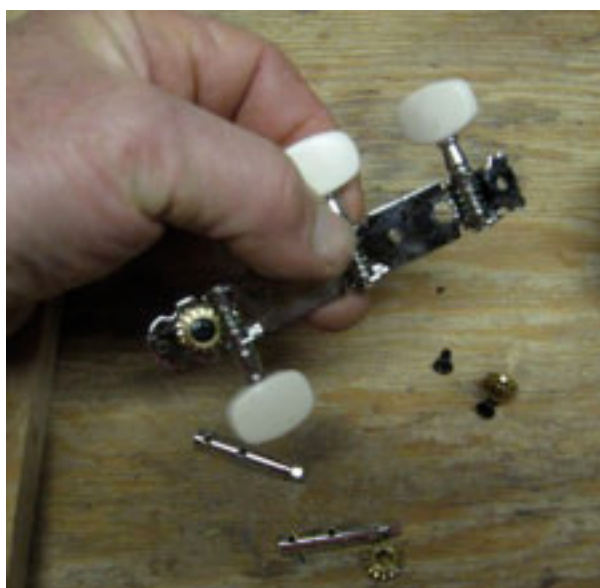




## STEP 6: REMANUFACTURING TUNERS

Ray “doesn’t want to get into too much money” so he buys inexpensive “3-in-line” tuners from Stewart MacDonald and remanufactures them to higher standards. Better tuners cost 3 times the price. It doesn’t take long!

1. Unscrew the brass gear from the shaft,



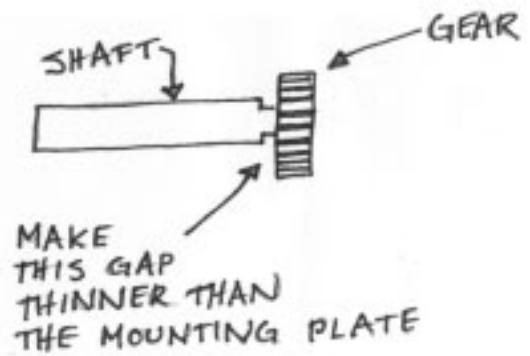
2. pop out the shaft and wormgear, which leaves you with nothing but the flat mounting plate.



3. The brass gear mounts on the end of the shaft, which is slightly thinner. Use a vice (or a metal clamp, or put the assembly on a solid metal surface and tap the pin into the gear with a hammer). Make sure to align the parts properly. Move the brass gear until the gap that holds the plate in place is thinner than the the plate.



Your goal here is to press-fit the soft brass to sit down tighter against the mounting plate, which eliminates wobbling of the shaft and takes out some looseness. In order to do this, you need to reduce the gap between brass gear ring and the rest of the shaft. It should be narrower than the width of the metal mounting plate — maybe about  $1/32''$ .



4. Carefully remove the brass gear with the claw of a hammer.



5. Re-assemble gear, worm gear, etc. Ray reverses the alignment of the tuner pegs so that they'll go on the bottom of the neck instead of the top. The purpose here is to mount the brass gear on the soundboard side of the instrument, so that when you tighten a string, it pulls the shaft tight against the gear and helps keep everything firm and in tune. (See illustration next page.)



6. tap the top of the assembly firmly with a hammer to mash the prongs down tight around the shaft; when you turn the tuner knob back and forth, there should be no play.



7. That's it! Ray says these work as well as the expensive tuners. Mine haven't gone out of tune yet!



## STEP 7: INSTALLING THE TUNERS

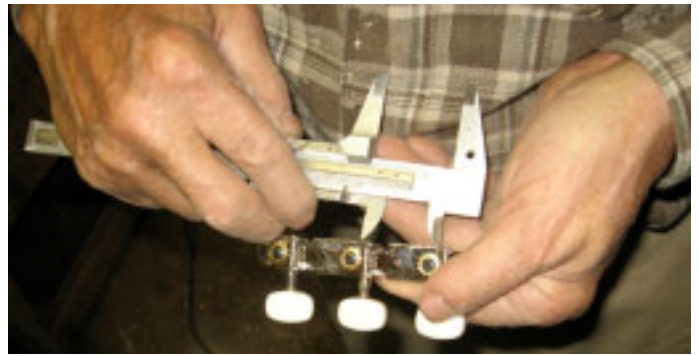
When you buy a set of tuners, you'll get 2 sets of 3 — enough to make two dulcimers.

You need to drill slightly over-size holes for the shafts, so that when you tighten the strings, they pull the tuner gears tight against each other. This helps prevent the kind of string slippage that would throw your dulcimer out of tune.

When locating the holes, set the tuner assembly with the brass gear on the sound hole side. Also make sure to leave a bit of extra length at the end of the headstock, or the screw might open a split in the wood.

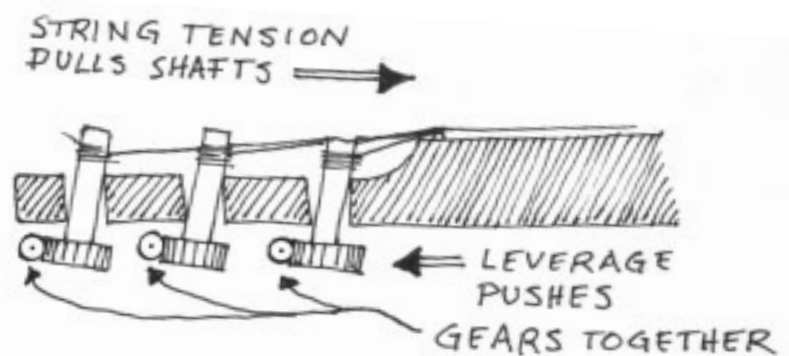
**IMPORTANT:** get the holes drilled in **EXACTLY** the right place, or your tuners won't fit (measure center to center)

**FOR PRODUCTION:** make a metal jig like this one that you can screw or clamp in place; clamp a piece of waste wood underneath, to insure a clean exit hole.



The holes you drilled for the tuner shafts are a bit big on purpose. When you set the hardware, you want the shafts to sit tight against the edge of the hole farthest from the soundboard.

The *exaggerated* diagram shows why: the tension of the string pulls the top of the shaft, levering it against the top edge of the oversize hole. That presses the gear tightly against the worm gear between knob and shaft. When you tighten the string, the shaft gets pulled against the neck, while the other end pushes the brass gear tight against the worm gear. The extra pressure helps keep it all in tune.







## STEP 8: MOUNTING THE TUNERS

When the shafts are properly positioned, mark the screw holes.



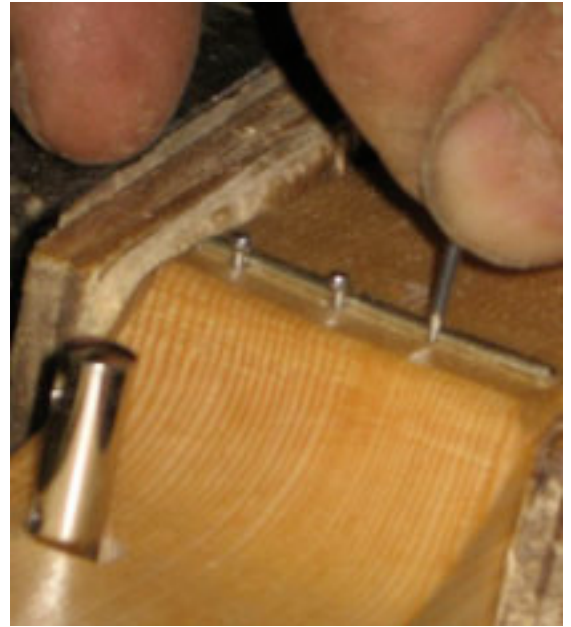
Ray pre-drills the hole with an appropriately small gauge brad for a bit (clip off the head first).

I don't have a picture of the finished head assembly with tuners.



## STEP 9: MOUNTING THE BRIDGE PRIOR TO STRINGING YOUR INSTRUMENT

The “nut” is typically a bit of hard stuff that stops string vibration between the tuning pegs and fretboard. In most guitars, the strings rest in slots the right distance apart, but Ray just uses a fret for a nut, and keeps the strings in place with small brads. The distance between strings here is NOT determined by an even division of the available width of the neck, but by the player’s comfort. Ray recommends about 7/16” spacing between strings, which leaves a bit of extra space at the top of the neck. If you had a stronger hardwood neck, you could make it thinner with more even string spacing.



As in the previous series where Ray was putting a new bridge on a banjo, here he’s gauging the proper height for the bridge. Once he’s got an idea of the height he needs, he mounts the strings. Finished string height should be 3/32” above the middle fret.

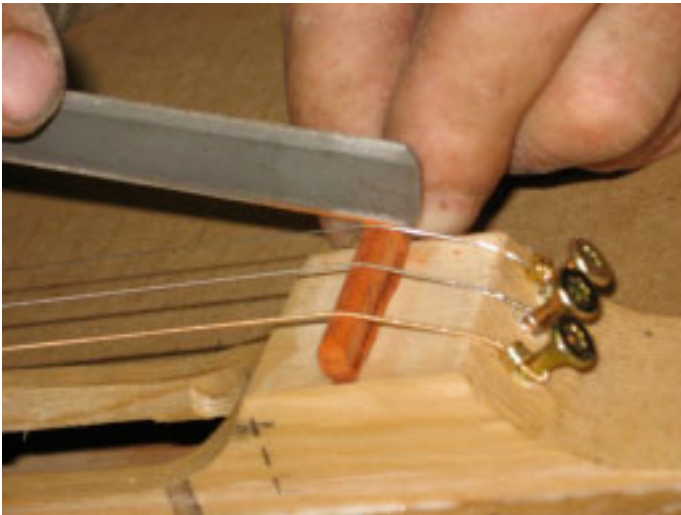


Each string has a loop or small eye at one end. Loop the other end through the eye to make a noose and pull that tight around the anchor screws.



## STEP 10: MOUNTING THE STRINGS & FINISHING THE BRIDGE

At the other end, Ray winds the strings onto their tuner posts, the bass string on the furthest post, and the treble string on the closest post to the body. He clips each string about  $3\frac{1}{2}$ " past its post, threads it about  $\frac{1}{2}$ " through the hole, bends the ends in a clockwise direction, and winds the string tight (the shaft should rotate clockwise). Then he gives it a bit of a stretch to remove any slack, and tunes it.



Ray determined the height of the bridge and then tested it against the bridge piece he made (in this case, a small piece of hardwood). The bridge ended up a bit high, so he cut slots to lower the strings. The tool he's using here is a special file, but he prefers the hack saw blade he's using in the photo below...

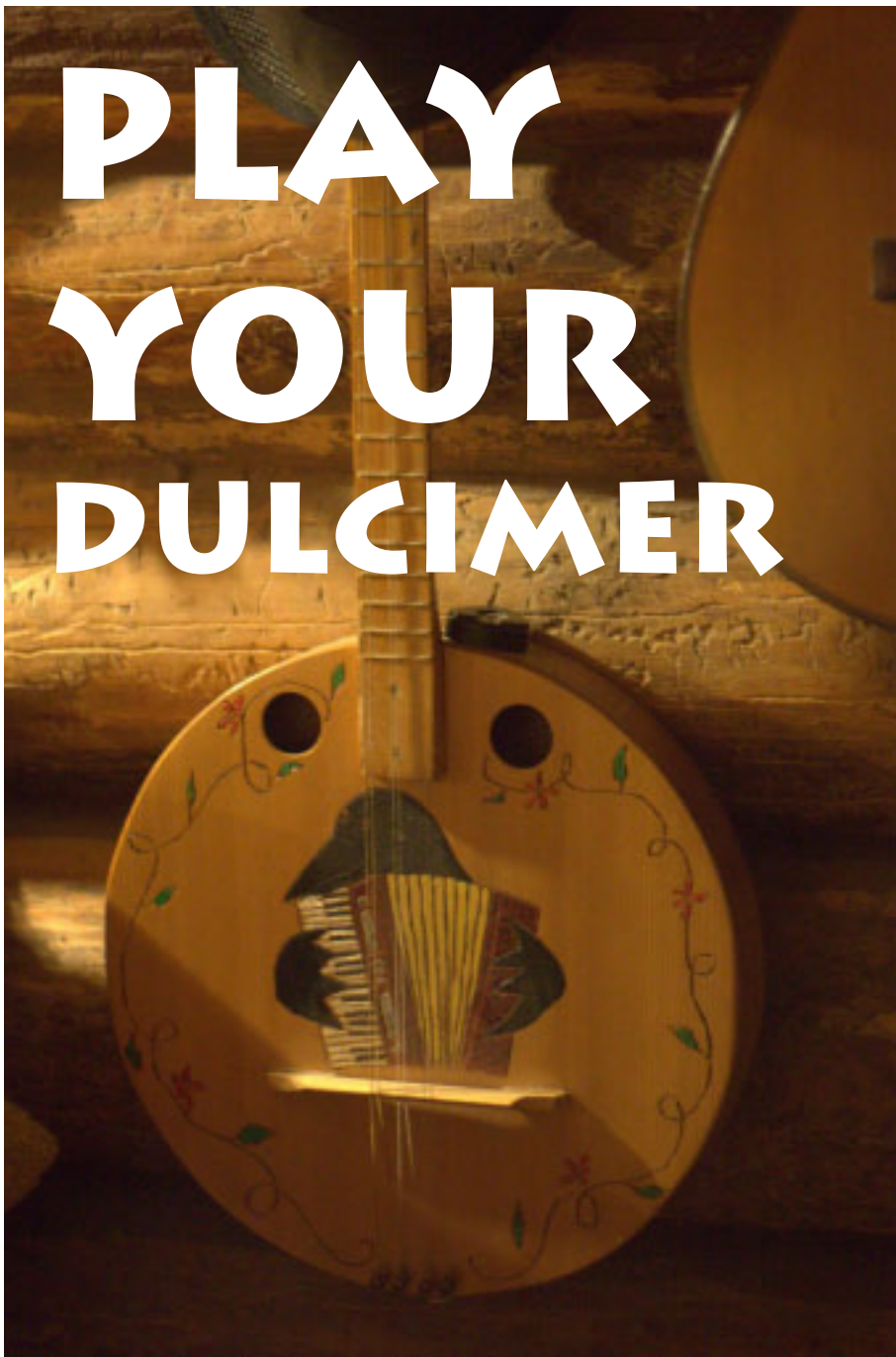


The bridge determines the finish length of the string. You do this by testing the notes halfway between the two string ends. In Ray's notation, that point is the fret marked with Roman numeral VII, on most other dulcimers it's the octave or 8th note, and on a guitar it's the 12th fret). That fretted note should be one octave higher than the same string



plucked freely — or, if you touch it lightly to get what's called a "harmonic," the note should be the same. (If you don't know about "harmonics," ask a guitar player). Minor changes in bridge location will correct the string length. When you've achieved the tuning, mark the bridge location, and glue it in place. (You will have to loosen the strings to do this.)





# PLAY YOUR DULCIMER

## THE SHORT VERSION:

1. Pick up your instrument and figure out a tune you know, one note at a time.
  2. "Forget what you did wrong and remember what you did right."
  3. If the music's important to you, you'll learn.
  4. Play with other people.
- Ray just demonstrated the last one. It used to "go without saying" but I need to keep saying it to myself, and if you hear it, maybe we'll get a chance to play together.

## TUNING IN THE MIXOLYDIAN MODE

There are a number of dulcimer tunings. The Mixolydian mode is the one used for the music I have written up until the present time. The two outside strings are tuned one octave apart, usually "D." (They can also be tuned to "C" or "E.")

The outside strings correspond to "do" of the scale; the middle string is tuned to "sol." The Mixolydian mode tunings, then, are D-A-D (most common), C-G-C, and E-B-E. In all of these, the intervals between string pitches are the same.

The diagram on page 49 shows how the numbers across the bottom of the neck refer to frets and indicate whole notes. There are only two half notes (sharps and flats) on this version of the dulcimer; those show as dotted lines. When you get good enough to miss the half notes, you can make yourself a new dulcimer with all the notes.

The chord chart (p. 50) shows the strings numbered 1, 2, 3, top to bottom. The #1 string is the thinnest and highest pitched (closest to your pinky finger when playing), #3 is the thickest, lowest pitched (closest to your thumb when playing).

The low string should be tuned an octave below middle C on the piano for the C-G-C tuning, one note higher for the D-A-D tuning and one note higher yet for the E-B-E tuning.



Tune the low string first, and tune the other two from it. Play note #4 on the lowest string. Tune the middle string to match it when played "open" (no finger on any fret). Then play fret #7 on the lowest pitched string or the #3 on the middle string. Tune the highest string to match that, and you're ready to play!

## PLAY YOUR DULCIMER THE LONG VERSION:

### TO PLAY CHORDS:

Hold your left hand around the neck as does a guitar player. When you play a chord (with each beat of the music) strum all the strings together, either with your right thumb or a flat pick.

Your left hand makes the chords. The part of the finger that touches the fingerboard should be vertical and centered on the string so it won't touch any other string and make bad sounds. Plenty of downward pressure makes a clear tone.

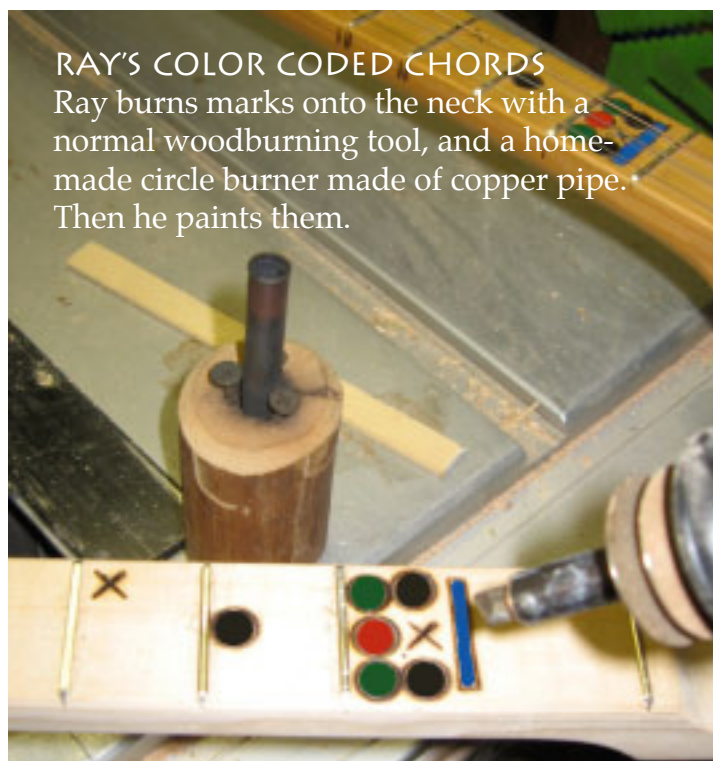
Keep your fingertip(s) about 1/8" from the frets for good tone without having to use undue pressure. Use whichever finger or combination of fingers is most comfortable for you.

Strumming without touching any strings gives a D chord.

Always center your fingertip firmly on the string to be played, just on the tuner side of the fret you are playing. Don't let it touch any string except the one you are playing (especially important when playing chords.)

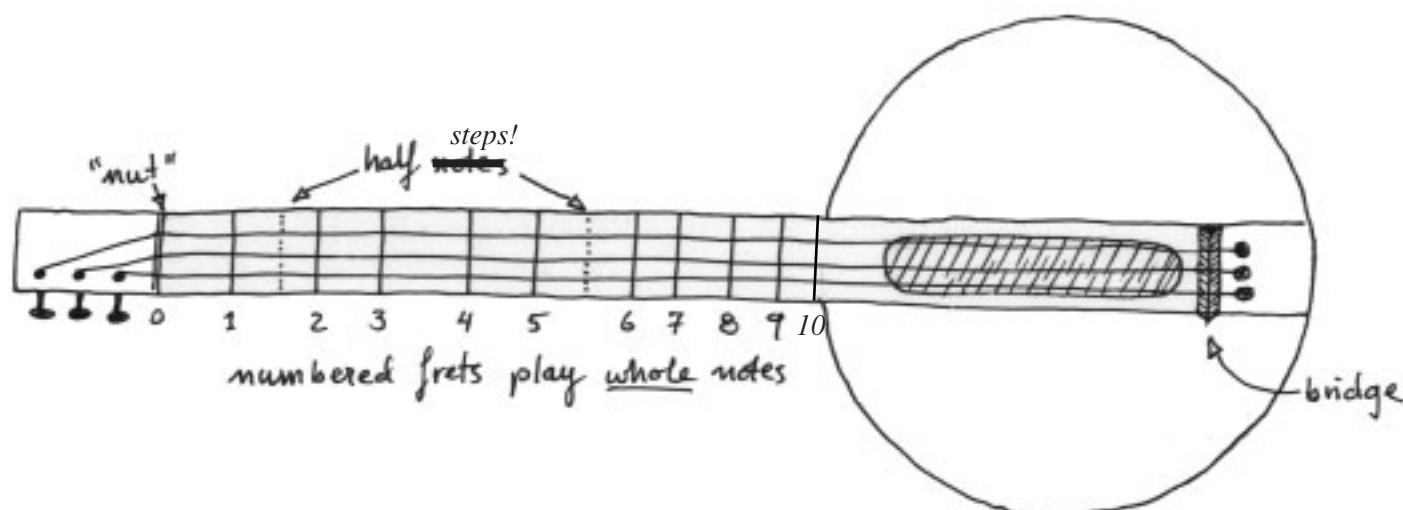
By fingering the strings marked with colored dots, "Xs", and

**RAY'S COLOR CODED CHORDS**  
Ray burns marks onto the neck with a normal woodburning tool, and a home-made circle burner made of copper pipe. Then he paints them.



bar (lay one finger across all the strings) and by strumming or picking all three strings, you can play the following chords. (see photo above)

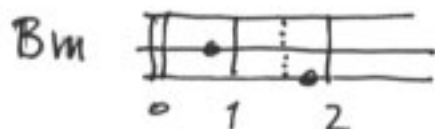
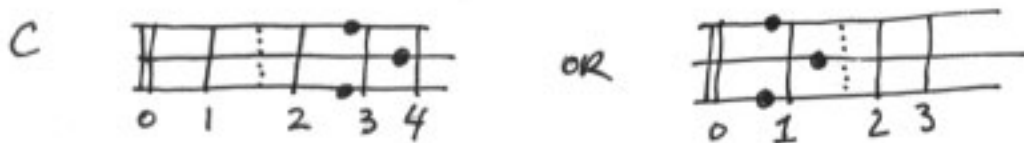
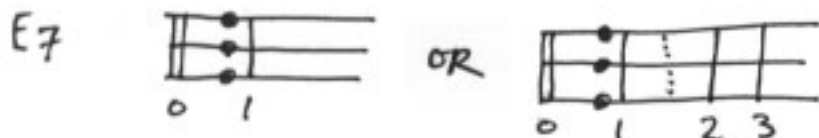
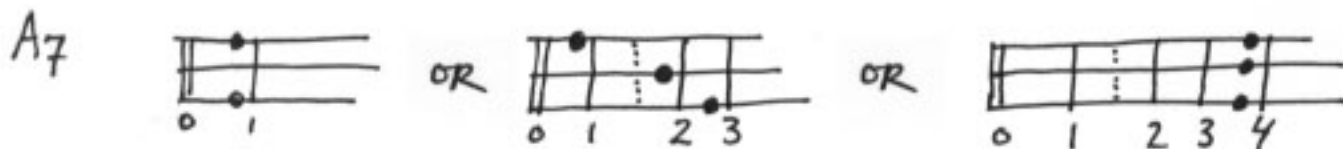
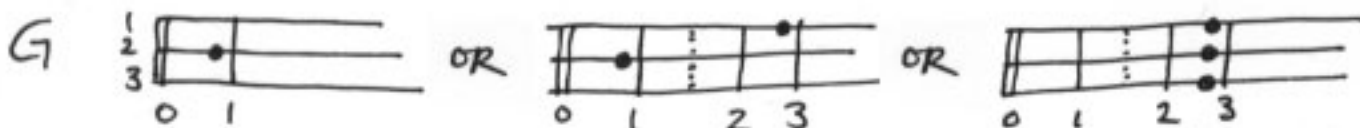
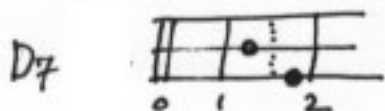
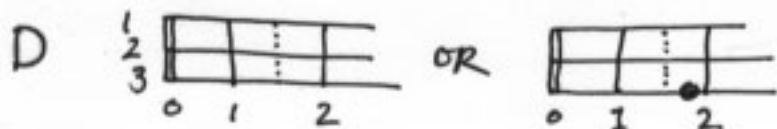
D chord	.....	No dots
G chord:	.....	1 Red dot
A (or A7) chord	...	2 Green dots
E (or E7) chord	....	Blue bar
C chord	.....	3. Black dots
Bm chord	.....	2 "Xs"



Each fret (except the dotted half-steps) indicates a note, which Ray numbers directly on the neck for ease of learning. The first note on each string is simply the sound the string makes by itself, so "no. 7" is really the 8<sup>th</sup> note. This is not typical of most printed music.



# BASIC CHORD CHART





# MUSICAL RESOURCES

Ray sells a 2-hour instructional video on playing the Rocky Mountain Dulcimer. If you want one, send him \$20: Ray Jacobs, POB 794, Eureka, MT 59917. He also has dulcimer-making videos, and CDs of his and Shirley's music — oh, and he makes instruments, too!

For a great book of 1200 classic folk songs, call 1-888-SING OUT (singout.org). Or send \$17.95 to Sing Out, P.O. Box 5460, Bethlehem, PA 18015-0460.

So you built an instrument. I built a book. We're even. There's so much info on the web for instrument builders that I wasn't sure a book was worth it, but I had fun, and I'm excited to share the results.

There's a huge web-based "community" of cigar-box guitar enthusiasts.

For downloadable plans, instructions, hardware, advice, and events, look up "cigar box guitars," "cigarboxnation," and all the variations you can think of. I hate the web, I love the web.

Maybe someday I'll have the kind of music in me that the guys at [www.sothosounds.org](http://www.sothosounds.org) have in them... WOW! I also recommend "landfill harmonic" on Vimeo, for a story about poor kids making rich music on instruments built from trash. There's a movie due soon.

I'm sure there's a lot more I should put down here, but someone else has already done it, and I want to get back to carving and playing dulcimer.

When the hunter plucked his bowstring, it made a pleasing sound. When the cook

thwacked her ladle against her hand, it made a pleasing sound.

Cut a stick — make a weapon; add string, make a bow for drilling, shooting, or making fire. Carve a bowl at the end of your stick, you get a vessel for service; cover the bowl of your spoon with skin, add string — you get rock'n'roll, Beethoven, and the blues.

The tradition goes way back, and includes cigar box guitars, the wash-tub bass, the Appalachian dulcimer, Ray's Rocky Mountain dulcimer, fiddles, banjos, lutes, harps, guitars, etc.

There's nothing new under the sun — except each new snowflake, each new baby, and the instrument you make for yourself.

Anthropologist friends brought back from Indonesia this beautiful big spoon covered in goatskin and strung to serve a different kind of nourishment.





## MEETING RAY

In May of 2012 I was teaching wood-carving at a primitive skills gathering near Santa Rosa, California. These gatherings feel like family camp and teach more than most schools. We start our days around a fire where “teachers” announce what they’ll be doing and how many people they can do it with. Everybody picks and chooses, making new things every day, or devoting themselves to a week of tanning a deerhide or making a bow and arrows; little kids hang out with their moms; older ones lurk on the fringes, run with friends, or participate as they can. People sit in circles on the ground making shoes, baskets, bows, flutes, spoons, bowls, metal blades, and skin boats – they learn to butcher goats, to start a fire by rubbing two sticks together, to fashion arrow heads from chips of flint or obsidian, to identify and use medicinal plants, etc. Modernity loses some of its urgency, but still hums through cel phones, laser-printed flyers, and acres of parked cars that mostly go undriven all week. Participants come from the backwoods and downtown, from academia and anarchist communes, to make a loose community of every kind and sort of person, from pierced and painted gutter punks who eat out of dumpsters, to retired dentists driving shiny RVs. While beliefs – or their absence – vary hugely, all share a common interest in what they can do with their own hands, and



despite divergent experience and stories, all recognize a common connection to shared roots, traditions, and learning-by-doing. All bring something to feed the community, whether it’s a skill, money, or volunteer labor for all the chores required to coordinate and feed a village of 500 folks for a week.

Ray’s contribution looked like a banjo but deeper and softer, with a gorgeous tone, from just cardboard, plywood, a 2x4,

and three strings. He called it a Rocky Mountain Dulcimer, and said he’d taught generations of fourth graders how to play it.

Nearly 20 years ago, I tried to teach myself guitar, and never managed more than the three simplest chords and a bit of bad fingering. “Three strings can make music like that?” I thought to myself after hearing a bit of Ray’s picking. “I think I can do that.”





I had no time to take Ray's class, but I paid him for a kit and my friend Tom took the class and assembled the dulcimer. Ray said if I had an hour, he'd start me playing. Fortunately, the hour went long, and included some of Ray's stories after which I realized that I wanted more than the instrument. I wanted to share Ray's invention and inspiration.

Ray's dulcimer combines traditional gifts of song and story with a simple design that almost anyone can make into a beautiful instrument – from about \$20 dollars worth of guitar hardware, and common, everyday stuff that regularly gets tossed in the dumpster. As Ray says, "this is an idea to be in all the schools." With funding for arts and music at historic lows, and with kids and adults hungry for practical, tangible, real projects that build up both

community and individuals, this dulcimer stands out.

When I was a kid trying to sing around the campfire with everyone else, I was told that I couldn't carry a tune in a bucket. For the next 25 years or so, I believed it. I tried to learn

guitar – probably when I was about the age of Ray's students, but like them, I found it difficult and complicated. I tried the trumpet, but people don't sing along with a trumpet. Plus, my older brother complained that I sounded like a dying cow, and I took it personally. In high school, I learned to read a bit of music and play melodies on a recorder, but I still wanted a campfire instrument. My godfather gave me a harmonica; I loved to make it wail, but a harmonica needs a guitar and voices, too. When I was older, I went with a gal who liked to sing. She signed herself and a girlfriend up for a fancy workshop at a fancy retreat center for folks with time and money (she was a downwardly mobile corporate lawyer). When the girlfriend canceled, she invited me – she would pay! Despite my doubts, and without a bucket to carry a tune, I said yes.







A black south African named Joseph Shabalala led us. Paul Simon had “discovered” and featured him on a popular album – but he brought his own tradition of communal song, and rather than “teach,” he simply wrote out a few words, gave us the tune, and asked us to stand in a circle and sing. He stepped around, and sang with each of us until he heard what he liked.

In one circuit, the turned us into a chorus.

I realized, “*I can sing!*” I didn’t need a bucket, I just needed a circle of singers...

All teaching begins by example. We learn to tell stories by hearing them. We learn to sing by hearing others sing. But too much of our teaching takes a

good example and turns it into a standard measure. We don’t invite students to participate, we demand a performance to evaluate. Rather than sharing our common joy with unique expression, we measure for compliance and sameness. Good teachers begin with joy.

Ray says it’s not a good day unless he can spend an hour



Every two weeks, Ray and Shirley get together with a group of folks to sing, play, and share potluck. The week my family and I were there, the group came to Ray and Shirley's. About 20 of us circled up in the log cabin, with Ray's home-made dulcimers (and guitars), a wash tub bass, wooden spoons, standard guitars, drums, accordions, fiddles, etc. We went around the circle, choosing, singing, and playing everything from old standards, to Beatles tunes, to originals written by some of the group. Ray likes a smaller group — this one, he says, "has gotten a little big." Rita, one of the participants, learned 20 songs on the dulcimer, and took them to the Czech Republic, where she started a folkgroup with student teachers of the English language...(see story on p. 57)



Jon Crandell photo

making music. He began his working life in his father's profession of forestry, but when his back gave out, he turned to teaching, and took on a 4<sup>th</sup> Grade classroom in the Eureka, Montana public schools. After school, he gave guitar lessons to a mixed group of kids and adults, but he noticed that he wasn't accomplishing much with the kids – the instruments

were too big, and fingering six strings was hard. "Well," he thought, "I'll build a simple two-stringed instrument." He'd been building instruments since he was 15, and put a new top on an old guitar. Later he worked in a sawmill that produced thin "shims," some of which produced a nice tone when tapped – and which he turned into a simple box guitar with a cutout

for his knee, and a red dragon painted by his brother.

For his fourth graders, he took a rectangular scrap of particle board for a back and made a small, simple box around it with a spruce top and a solid neck of 2x4 stock. He epoxied bits of brass brazing rod into the neck for frets, and used bolts for tuners. ("That didn't work too





Rita Colins playing one of Ray's "Onion" dulcimers. This one has a spruce top. Jon Crandell photo

good," he recalled, but he also figured that "since this one's just for me, I'll put in another string.") By accident, he tuned it to what's called the "Mixolydian" mode.

"That sounded to me like an instrument I'd heard on the radio called an Appalachian

Dulcimer, so I called it a 'Rocky Mountain Dulcimer'." The very next week he welcomed a new 4<sup>th</sup> grader from Mississippi whose father owned and played the first Appalachian dulcimer he'd seen. Then he met a neighbor who made stringed instruments using no power tools – including an Appalachian dul-

cimer. "He didn't think much of my dulcimer," said Ray. "It wasn't traditional, and it wasn't beautiful."

But it sounded good, and his kids could play it, so in 1976, he started making dulcimers in school. He made kits at home in his shop, and the kids assembled and finished them in class after their daily assignments.

Ray used other "fun" activities to motivate his kids for academic work. Every year, he'd put an engine in the middle of his room for the kids to take apart and put together; he cut 55 gallon drums in half so the kids could bring back samples from a local pond – "after we did those pond studies, those kids wouldn't squash a fly; they were too interested by then."

He gave the kids a half hour every day to work on their instruments; after a couple of months most would be practicing on their own dulcimer. By the end of the year, most could play chords and melody for several songs. He charged \$25 for a kit, but kids who weren't able to pay still got to make and play an instrument.

When Ray was born, his father was working as a forester in Minnesota. Later, when the US Forest Service gave him a job in Montana, they moved.

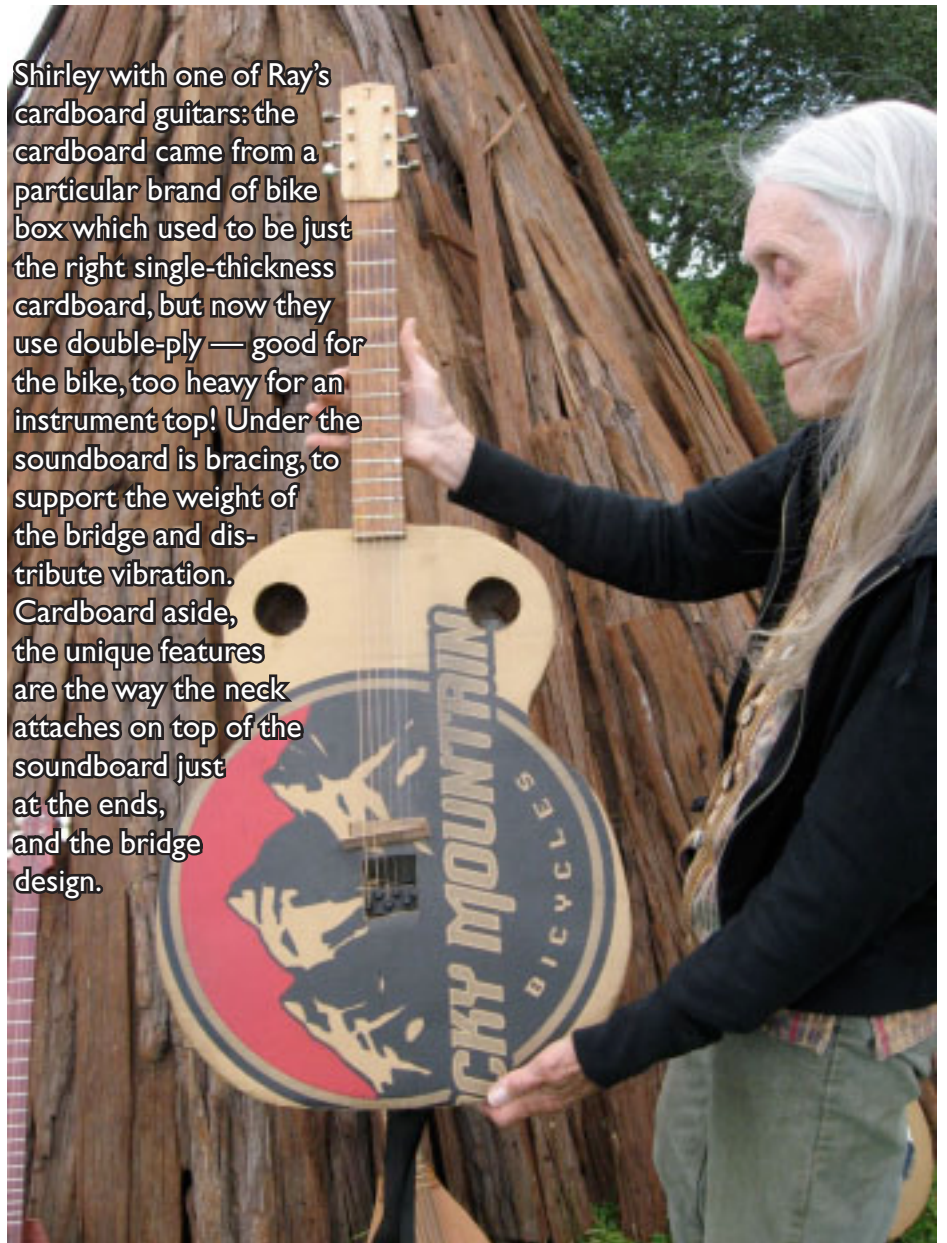
Ray's father had studied a bit of violin in his youth, sang in a barbershop quartet in college,



and played harmonica, which Ray picked up when he was 8. Ray's mother sang a large stock of songs to her four kids. Her father, "Granpa Ray," sang, told stories, and could recite all of Longfellow's poetry, as well as stories from Kipling, Aesop, and others. Ray started playing guitar at 15 and fiddle at 40. Now, he says, hardly a month goes by that he doesn't make an instrument, but more important for this story, Ray plays a central role in a folk group that gets together to sing and play twice a month. They gather in each others' homes, and share potluck as well as music. We happened to visit when they were meeting at Ray and Shirley's, and added a song or two to the circle. Many of the folks had one or more of Ray's instruments in their hands or in their collection at home.

Writing this, I recalled the work of Robert Putnam, a Harvard sociologist whose academic study of Italian democracy morphed into a best-selling book called *Bowling Alone*. He had gone to Italy in 1970, to study the creation of new local regional governments. For two decades, he studied democratic participation. He concluded that the primary indicators for democratic participation were not union activity, or political activism, or educational access, or income level. Rather, the primary indicators were things like membership in soccer clubs, choral societies and (in the U.S.) bowling leagues.

Shirley with one of Ray's cardboard guitars: the cardboard came from a particular brand of bike box which used to be just the right single-thickness cardboard, but now they use double-ply — good for the bike, too heavy for an instrument top! Under the soundboard is bracing, to support the weight of the bridge and distribute vibration. Cardboard aside, the unique features are the way the neck attaches on top of the soundboard just at the ends, and the bridge design.



People gather in such groups for the joy of structured play and shared pleasure, variously formal and informal, rule bound and improvisational, cooperative or competitive. When we cooperate, we *work together*, when we compete, we *seek together* (in Latin, *com* means "together," and *petere* means "to seek"). Either way, it only works when we *all* participate, no matter how we differ in belief or political persuasion.

Cohousing bylaws don't make a community any more than any legal or moral creed or political platform. But take a willing group, even a motley crew with divergent experience and abilities, and *if* they share a need and desire to feed and be fed by each other, then you'll make music — and community (which, like competition and cooperation, combines *togetherness* with *motion* or *change* — *munis* shares a root with *mutate*).



I looked for someone else to write this book – someone more musical, who understood the language and knew about instruments. Noone had both enthusiastic and time. Then I had to travel east, and the opportunity to visit Ray presented itself. I may not be particularly musical, but Ray and I share a similar approach to life and design.

Ray will try things, and he he'd rather find a way to do what he needs done with what he's



Jon Crandell photo

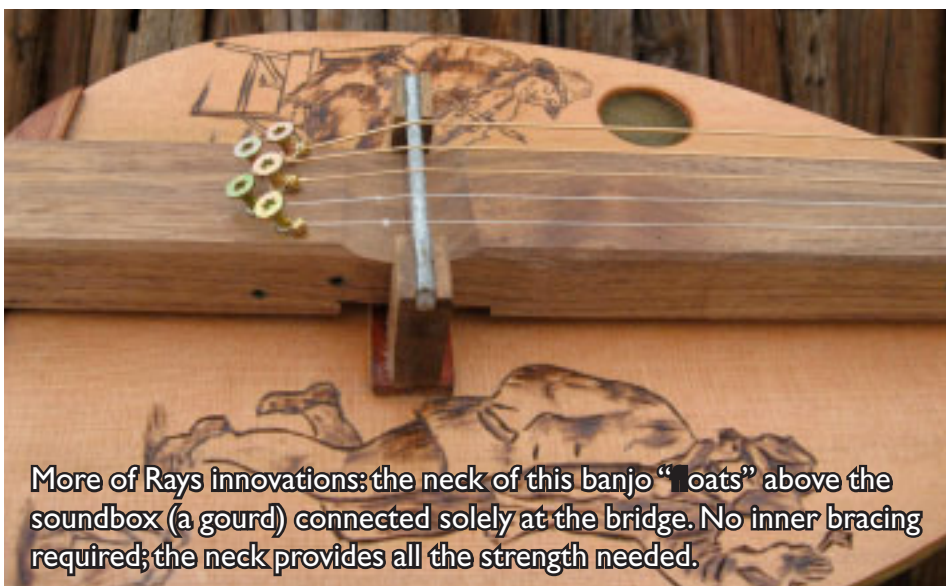


Jon Crandell photo

already got, instead of buying something new.

We got along pretty well, and after he showed me about building a dulcimer, I helped re-build the earthen oven he'd made for Shirley. When the folk group showed up to spend an evening singing and playing, all those talented people encouraged me to try out the tune I'd been practicing. In addition to my instrument, I took away inspiration — not only to make more instruments, but to look for people to play with.

To carry a tune it takes — if not a bucket, perhaps the proverbial “village” — with different people taking turns, making the instruments, leading the tune, and coming up with new songs.



More of Rays innovations: the neck of this banjo “joats” above the soundbox (a gourd) connected solely at the bridge. No inner bracing required; the neck provides all the strength needed.



# FAME: AN AMERICAN TEACHER AND HER CZECH STUDENTS LEARN LANGUAGE AND HARMONY BY SINGING AND PLAYING...

By Rita Collins



*Editor's note: I met Rita Collins at Ray's folk music potluck. She coordinates Arts and Education Programs in Eureka, Montana. In 2008 she taught in the Czech Republic at the department of English language and literature in the Faculty of Education at Masaryk University, in Brno. Her Czech students were studying to become teachers of English language. When she learned that the department head was going to have a birthday, she offered to teach her students a English-language birthday song to sing in celebration. They had so much fun, they started FAME – or “Fun with American Music for Everyone” – which helped them improve their command of the language, and invited them, informally, to share their pleasure and enthusiasm for something much deeper than simply earning a degree or a living. Rita's account of the project follows.*

Without free, self-respecting, and autonomous citizens there can be no free and independent nations. Without internal peace, that is, peace among citizens and between the citizens and the state, there can be no guarantee of external peace.

—Vaclav Havel

Every Tuesday evening, members of FAME would gather to sing, to listen, to laugh, to talk. FAME is a vision of the possible. It shows that even those who think they have no talent can sing. Students studying to be English teachers performed widely, attracted donations, and even received the Czech Republic's 2010 Label Award.

FAME is about giving. Students received no credit, nor was it part of course-work. Members gave of themselves to make music which they gave freely to others. One Czech teacher said FAME was a wonderful example of what Vaclav Havel meant by a civil society.





children who later performed with the adults.

At an opening of an exhibition of quilts, FAME was hired to sing a collection of African American spirituals, such as "Somebody's Knocking" and "Ain't Gonna Let Nobody Turn Me Around." By the time FAME performed at the English Department's next holiday party, they had fans, as well as new members. The eight to ten

It began when Rita Collins, an American teacher at the Czech Republic's Masaryk University, asked some student English Language teachers to help sing a birthday song to Svetlana Hanušová, the Department head.

Rita, however, couldn't find a printed or recorded version, so she sang the song for the group; they worked out harmonies, a guitar back up, and musical notation. Their performance of "On The Day Svetlana Was Born" brought smiles and even tears to the audience – a beautiful beginning.

Everyone wanted to learn more songs so Rita collected lyrics that summer and learned to play them on the Rocky

Mountain dulcimer. That fall the group started meeting and developed a website for sharing lyrics and recordings of children's songs, traditional folk songs, old time spirituals and personal favorites.

The group added voices, instruments, and a manager who organized things and assembled songbooks. Concerts followed: for the English Department, at a primary school, and by the next summer at an international conference hosted by the English Department. They developed new routines, and even choreographed some of their songs. Some of the teachers began an after school program where they taught songs to

twelve or fourteen, including a new guitarist and two singers with formal training. Group members developed their skills, took up instruments, or spent more time practicing.

There was a lot of laughter at the Tuesday practices; the music infiltrated everyone's bones. After practice, people often sang as they went home. FAME has been known to sing in the lobby of the faculty, on trams, at bus stops, for the porter, in elevators and most recently, at Alex George's third birthday party. Although FAME is about using English to sing, to find enjoyment in the language and to share that enjoyment with others, it is also more. Much more.



# ABOUT HAND PRINT PRESS

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**"What we learn to do, we learn by doing." — Aristotle**

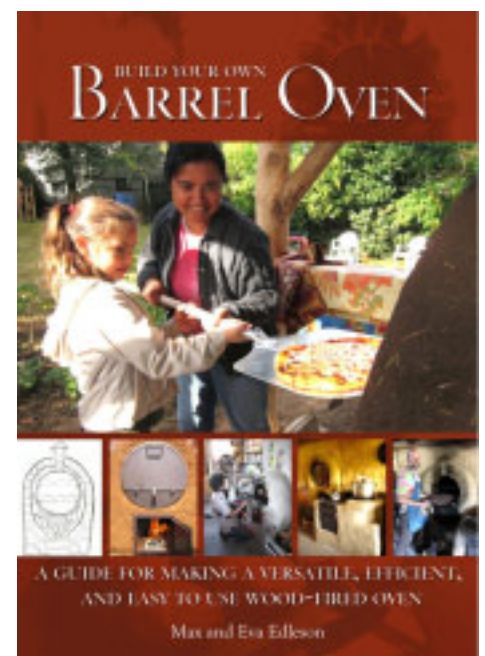
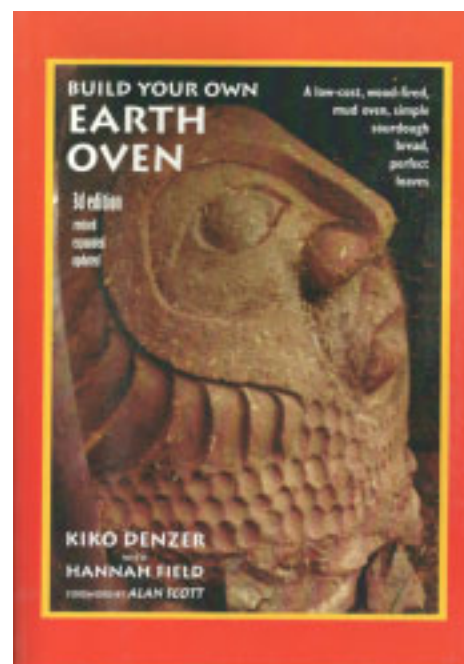
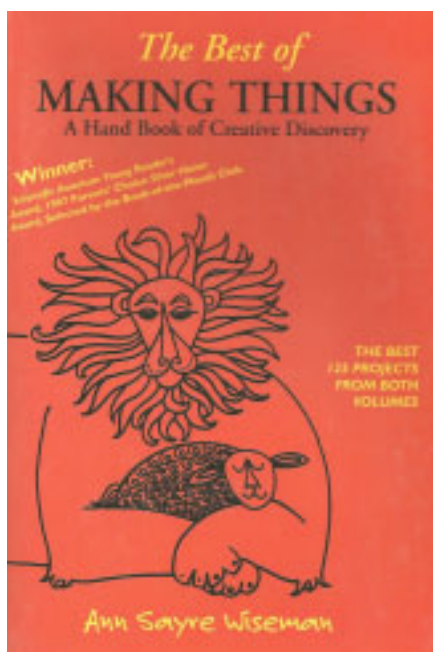
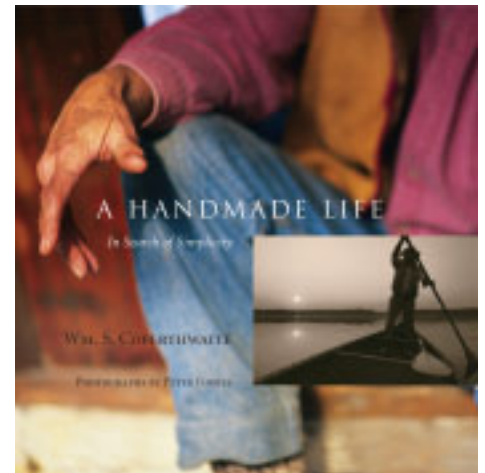
We offer books and experience to help more people participate more fully in their lives, and communities. The titles on the website (our own, and others') address the arts of living, from making stoves, ovens, and other things, to growing food and building houses, and otherwise learning to follow nature's creative (and chaotic) principles.

Publishing means to make public — and a healthy public participates in the life of the nation — in every aspect of work and life, not just shopping.

The founders understood that the Latin root of "republic" means "things of the public;" they believed that every citizen shared responsibility for land,

livelihood, and our childrens' futures. Without a healthy, participating public there can be no private nor common wealth. Unless we all feed the goose, there can be no golden eggs!

The arts of living can't be abstracted. Aristotle said, "what we learn to do, we learn by doing." So Hand Print Press follows the way of the doer, designer, artist, inventor in all of us, who works to fit into her place and his community, to marry beauty with utility, and to restore and enrich the sources of all beauty.





# DULCIMER KITS: HOW TO ORDER

I don't want to deprive you of the opportunity to exercise your own hands and wits (as Bill Coperthwaite might put it), but I also recognize that sometimes, it makes sense to let people do what they love most, and trade for the things they want but don't have time to make for themselves.

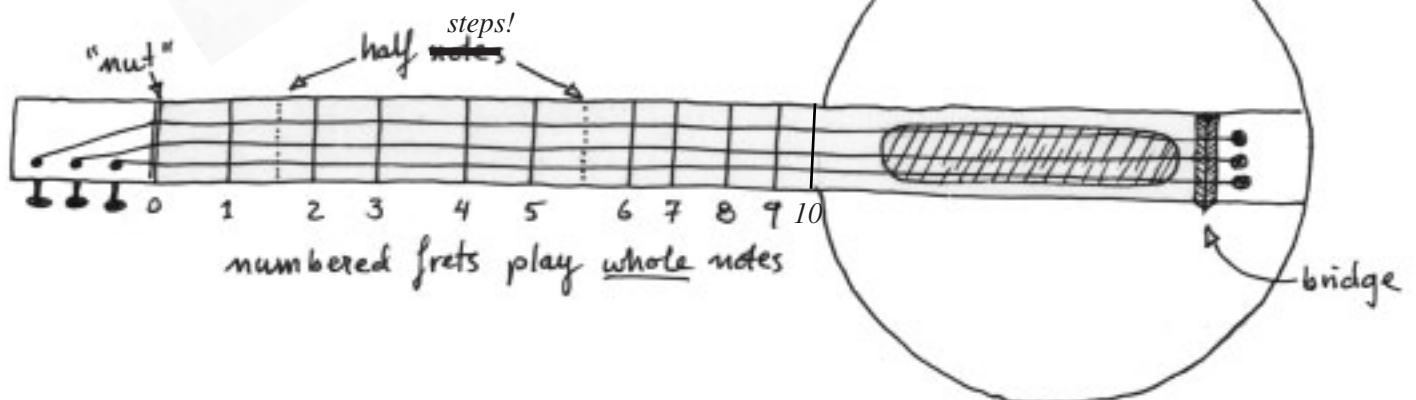
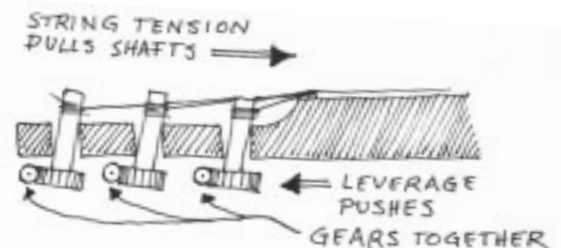
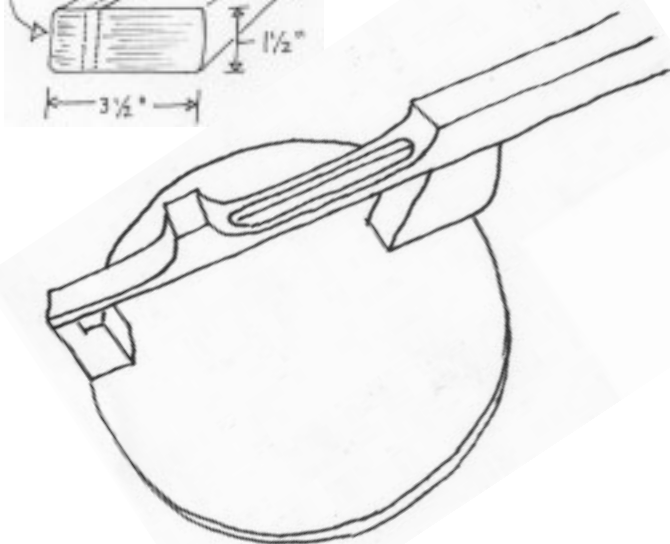
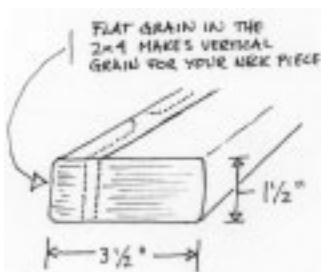
So — if you want a dulcimer but have not time or space to do all the work yourself, I know some craftsmen who can provide you with dulcimer kits (or even finished dulcimers, but I don't really want to deprive you of all the fun!)

Dulcimer kits consist of a neck, back, and all the bits and pieces: blocks, cardboard, tuning pegs (already re-manufactured), and strings. All you have to do is put them together, glue them up, decorate, and finish.

Ray was selling kits for \$100 when I met him in 2012, but I don't want to start a franchise here, I just want to make sure that folks who want instruments can get them — and perhaps help a few neighbors who want to work at home doing what they love to do.

I'm not sure how best to go about it, but here's a start: If you'd like a kit, get in touch with me, either through the contact form at [handprintpress.com](http://handprintpress.com), or at POB 576, Blodgett OR 907326, 541-438-4300, and I'll put you in touch with a maker and you can figure out the details.

If you're a maker, let me know that, too, and I'll add your name to the list. That way, maybe we can hook up makers and players, teachers and learners all where they live, so they can all make music together, too!





A man with long white hair and a black jacket is standing in a grassy field, holding a guitar made from cardboard boxes. The guitar has a circular logo on the body that says 'CITY OF MUSIC' and 'BICACTES'. In the background, there is a large pile of cardboard boxes and another guitar made from cardboard boxes leaning against it.

**Here's  
a guide  
for anyone  
in need of  
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affordable  
instruments  
suitable for  
beginners  
and experts  
alike. Teachers,  
homeschoolers,  
camp counselors,  
church groups,  
community  
minstrels, &  
all who like to  
work with their  
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it to transform  
'just junk' into  
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