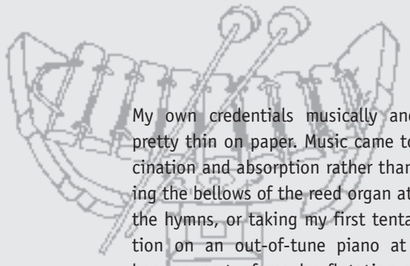
MIDDLEGROUND 3

Make-do

All the delights of bringing a Balafon/Marimba into the world in an easy-step guide to wooden music know-how

Words to the would-do by Marimba-making smart socks Andy Wilson



My own credentials musically and as a woodworker are pretty thin on paper. Music came to me by a process of fascination and absorption rather than by rote. Whether pumping the bellows of the reed organ at church while dad played the hymns, or taking my first tentative steps into composition on an out-of-tune piano at the age of five, music became part of me by flotation rather than notation. In woodwork, while some of the boys made small boats in one part of the workshop, I was made to change the title on my notebook to WOULD WORK and left with a couple of wobbly dovetails and a small oak tray. But don't be sad – the story has a happy ending. Years later these two shaky threads twined together again while living in California and becoming inspired by instrument makers producing extraordinary musical creations in wood and metal – tongue drums inspired by the Aztec log drum, waterphones, where metal rods attached to stainless steel bowls are played with a cello bow producing ethereal 'whale songs', and all manner of tuned and untuned percussion instruments inspired by African, Latin American and Asian models. My room in the Mission district of San Francisco soon became a jumble of plans, pamphlets, scrap materials, borrowed tools and sawdust, and many tears and blisters later various working prototypes emerged and were eventually transported back to England in a large canvas sack to form the basis of 'Knock on Wood' (see later). One of the first instruments was a Marimba made from Douglas fir and plastic tubing.

Xylophones, Marimbas and Balafons are all versions of the same idea – a series of wooden bars of graduated length tuned to a scale and played with wooden sticks or soft ended mallets. Within this broad description fall countless instruments found everywhere from South East Asia, through Africa to Europe and Central America. In a simple form a xylophone could be made based on the Ugandan Amadinda – 15 to 17 wooden bars laid across supports on the ground and played from opposite sides by several people at once. (See Peter Cooke's wonderful pamphlet and tape 'Play Amadinda' to get you started on this exciting and sociable technique.) Choose wood with a straight, close grain avoiding knots. Tropical hardwoods have traditionally been used but many people now avoid these unless they can be proved to be from sustainably managed forests (see wood suppliers). I've used European hardwoods like cherry, maple and beech with success or you may like to recycle tropical woods from old furniture (usually best to ask permission of the furniture owner first). Experiment with different woods. Each will have its own sound characteristics of brightness or warmth. I've used cherry, beech, and recycled padouk and mahogany.

The wooden bars

Wooden bars when tapped have a particular mode of vibration which pivots around two points of minimal movement around 22.5% from each end. This is where the bars have to be rested or suspended to allow the best tone. First cut bars of 4 x 2 inch wood to the following lengths:

26¼, 24¾, 23⅜, 22¾, 21⅜,
20¼, 19⅝, 18½, 17½, 16½, 16,
15⅛, 14¼, 13⅜, 13⅛ inches.

That takes 30 feet of wood approximately. You can scale the whole thing down proportionately to use smaller section timber and shorter lengths.

Mark the nodes, then, starting ⅜ of an inch towards the centre from the nodes, cut away the underside of each bar leaving approximately half the original thickness. Although this arch is not essential, it will give the bars a lower and warmer tone than a bar of the same length left unarched.

Tuning

There are many methods of dividing an octave into a scale of pitches, and it is a fascinating subject in its own right (but beyond the scope of this article). If you want to use your xylophone with Western instruments, you are best off sticking to the familiar scale of the piano, pitch pipe and electronic tuner, but experiments with African and Indonesian tunings are possible by retuning your instrument (either temporarily or permanently).

Sound your lowest bar by resting it at the nodes on pieces of foam or cloth and tapping it with a soft mallet. By reference to another instrument or tuner find which is the nearest note and, if you are happy with that being your starting note, fine tune it as follows:

If your bar is sharp or higher pitch than the note you want, you can lower the pitch by shaving more wood from the arch underneath. Steady, it doesn't take much and you wouldn't want to overshoot!

If your bar is flatter or lower than the desired note, you can raise the pitch by shaving wood off the underside at each end of the bar. Repeat the process with each bar until you have the required scale whether diatonic (like the white notes on your keyboard), pentatonic (try singing the first five notes of 'Every Little Breeze Seems to Whisper Louise' if you happen to know it or C, D, F, G, A) or equidistant heptatonic suitable for West African xylophone music. (See box for those wanting to try this.) You can also alter the pitches of your xylophones temporarily by using lumps of blu-tak attached to the underside of the ends of the keys, lowering the pitch of that key. Experiment with blu-tak quantities to get the desired pitch change.

Suspension

Lay the bars side by side with a quarter of an inch gap between them to get the proportions of your support frame. This consists of two long pieces of wood running under the nodes of the sound bars, and two end pieces to fix these long supports the right distance apart. Glue a piece of thick draught excluder along the top of each support.

Next you need to hold the bars in place to avoid them shooting off across the floor when hit. You can drill a vertical hole at one end of the sound bar (at the node point to avoid disrupting the vibration) which then locates on a peg on your supports. The other end of the bar can be held by two more pegs, one at each side. The pegs can be of thin wooden dowelling or nails with their heads snipped off and filed smooth. The peg is then covered with a sheath of rubber or plastic tubing and there should be some clearance between this and the wooden bar to allow free vibration.

Alternatively you can drill two horizontal holes through each bar (again at the nodes) through which you can thread a strong support string to produce a 'rope bridge' effect. Thread some pieces of rubber tubing each about a quarter of an inch long on the string between the notes to prevent them clashing together. With this design you don't need the support bars because you can string the bars up between any two supports (a couple of trees are ideal). You will lose a bit of resonance created by the space between the bars and the floor as in the first design.

Resonators

Added volume and warmth of sound can be created by amplifying your bars with some form of resonator. In its simplest form this can be a hole in the ground under the instrument, but if you don't want to spoil the living room carpet, an alternative is needed. This could be in the form of a box to mount the instrument on with the base of the box getting shallower towards the treble end. On a more sophisticated level, each bar can have its own resonator, but the size of this is crucial if it is going to have the desired effect. In Africa and Central America, different size gourds are used, the right size for each note being found by trial and error. You can also use plastic tubing around 2⅛ inches diameter, open at the top under the sound bar and sealed at the bottom end with a disc of plywood glued into place. (Even a small leak in the seal will lose the resonance.) If you are handy with a calculator there is a formula to determine the length of your resonator tube:

$$L = \frac{C}{4F}$$

L is the length of the resonator, C is the velocity of sound (13560 inches per second), and F is the frequency of the given note in cycles per second.

Stopped listening? The book *Sound Designs* gives more details including a chart of frequencies for each note.

Beaters

Inexpensive percussion mallets can be found in music shops with either soft felt or rubber ends. Even better is the superball mallet. Take a standard superball just under an inch diameter, carefully drill a hole halfway through and superglue it to a piece of dowel or plastic rod. The compressed silicon of the ball bounces off the xylophone in a fraction of a second allowing the bars to vibrate freely. Make plenty of mallets while you are at it as they can self-destruct after enthusiastic playing.

Books

Making Simple Musical Instruments by Bart Hopkin
30 novel and exciting plans for instruments using innovative designs and unusual materials. £14.99
Play Amadinda by Peter Cooke
Build your own Ugandan 'amadinda' and learn several traditional pieces. £9.50
Sound Designs by Jon Scoville and Reinhold Banek
Another recipe book of original instrument designs using new and scrap materials. Includes a xylophone and a metallophone using metal tubing. £9.99
Xylophone Music of Ghana by Trevor Wiggins
The Grove Dictionary of Musical Instruments
Three or four large heavy volumes full of information on every instrument imaginable. If your local library doesn't have it, suggest that they get it!

Wood suppliers

The Ecological Timber Company
John Boddy Timber

Knock on Wood

With roots going back to 1979, a shop from 1988, a mail order catalogue and now, of course, an Internet web site. All the above books are available from them.
Shop: Granary Wharf, Leeds LS1 4BR. 0113 242 9146
Mail order: Knock on Wood, Unit 131, Glasshouses Mill, Harrogate HG3 5QH.
Email: kow@globalnet.co.uk
Website:
http://www.netlink.co.uk/users/nettle/kow

Andy Wilson is the remaining member of the original 'Knock on Wood' team.

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