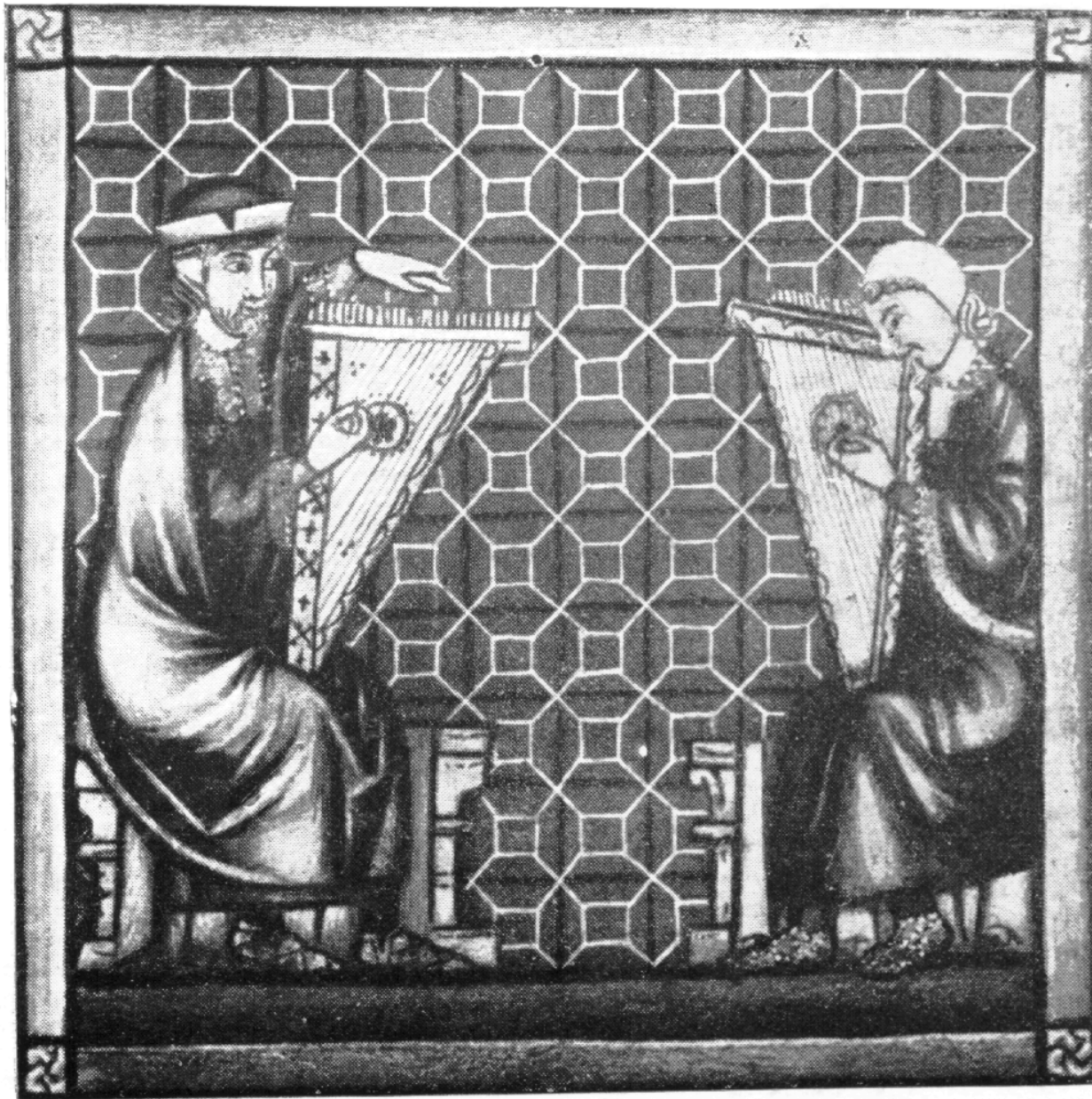


The Psaltery or Kanon (Canon -- Canale -- Qanon)



The *Cantigas de Santa Maria* manuscript ca. 1260. Here are two kanons being tuned and played. There are many shapes of psaltrys, however this one resembles the modern qunan shape and is interesting in many ways. **This is the model for reproduction.** The tuning wrench being used by the left hand figure should be noted -- shows use of metal tuning pins.



French, Lambertus Treatise, 13th Century ("King David with Musicians" in the Bibliotheque Nationale, Paris, MS. lat.6755(2), fol. Av).

The psaltry in this picture shows the empty area (the corner where the string length is too short for use) This is the same shape and type as in the Cantigas illustration (the one chosen for reproduction). A double row of pegs can be seen – this clearly indicates double stringing even though the lines for strings do not show it.



Psaltries come in many shapes and sizes.

Music and Her Attendants. Fourteenth-century Italian miniature illustrating the De arithmetica of Boethius.

A pig snout psaltry.



Hans Memling 1480 – a psaltery on the far left. **Two inches thick – an on-going theme.**



12th century psaltery – an early European representation. This is so similar to the period instrument I have in my personal collection dated 1650. **Note this three dimensional carving clearly shows a thickness of about two inches.** How many examples is that now? Counting the three to follow below, the total is up to five examples from illuminations, and one more from an existing instrument. **That is SIX examples, all singing the same tune.**



Two more 12th century kanons Again – **thickness of about two inches on these two and thickness is clearly shown on the below stair step psaltery – Two Inches!** That is enough examples and consistency to make a reasonable assumption for the Cantiga Psaltery reconstruction.

The qanun is a descendent of the old Egyptian harp and has played an integral part in Arab music since the tenth century. A kind of dulcimer, its Arabic name means 'rule' or 'law.' The qanun was introduced to Europe by the 12th Century, becoming known during the 14th to the 16th Century as a psaltery or zither. The form of the qanun consists of a trapezoid-shaped flat board over which 81 strings are stretched in groups of three with 24 treble chords consisting of three chords to each note. The instrument is placed flat on the knees or table of the musician; the strings are plucked with the finger or with two plectra, one plectrum attached to the forefinger of each hand. More than any other instrument in Arab music, the qanun is suitable for the display of virtuosity, the execution of fioriture and rapid scales.

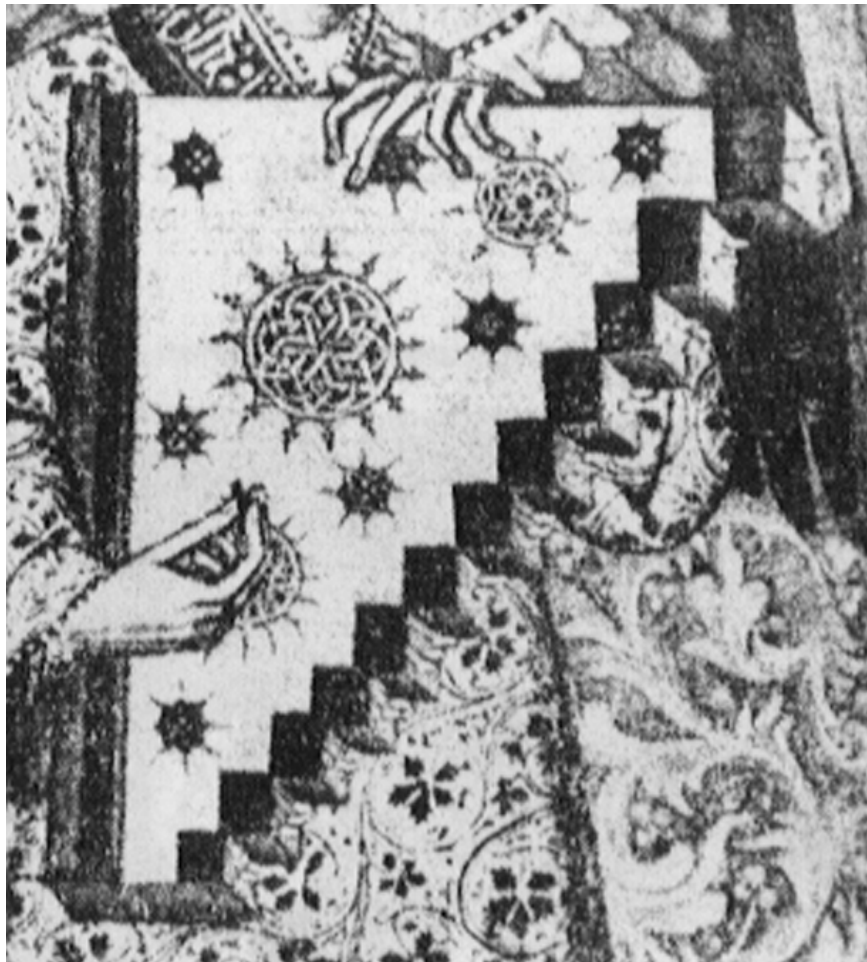


Figure of angel playing the psaltery, from a triptych dated 1390, from the Monasterio de Piedra, now in the Museum of the Royal Academy of History

Figure of an angel playing the psaltery, from a triptych dated 1390 from the Monasterio de Piedra, now in the Museum of the Royal Academy of History.

The stair step psaltery of the 1390 angel clearly shows 3 tuning pins at the end of each step with 3 strings attached for each course. Psalteries have paired or tripled strings, the top row of tuning pins on the Cantiga psaltery (the project psaltery) shows many pins. It is not clear from the illumination how many strings are paired nor is it clear how many courses but it is clear from the number of tuning pins that there are more than one string per course. At least 2 per course are indicated by the number of pins shown and by tradition – harps have one string, psalteries have 2 or more per course. **Laying out the string placement on the plans allowed for discovery – the strings must not be too far apart, nor too close – optimal playing distances are known and used for this project - - measurements from qanons and instrument below.**



Picture of 1650 German export Psaltery (hammered dulcimer) Original in the authors private collection. Only other known one extant is in the Smithsonian. Again 2 inches thick!

Strings are in pairs – two strings to a course. The table is 4 mm thick and the back 2 mm. This construction detail is important to structural integrity of the whole.

Construction Notes -- The psaltry from the Cantigas de Santa Maria illustration:

Not every conceivable question that could be answered will be here – The volume of material and data necessary to do so would and does fill large books on the subject of the luthering craft. I have two books on just varnish. If wood could have been worked with period mill power tools such as water, wind, or muscle-mechanical (foot powered treadle lathe or bow drill) modern equivalents were used as appropriate substitutes. If the work warranted hand tools or required them, I used them – the list includes:

Hand finger-powered twist drills, scrapers (made by me), some hand saws (coping, fret, hack, and finishing and jewelers), hammer and chisels, planes, knives, gouges, files, reamers, and calipers. In all cases, hand tools are used, when finishing inside the walls and back of an instrument – *this is done with hand tools* – hammer and chisel, scrapers and such. Power tools are too rough and split and ruin the very thin wood when carving. One must feel the proper amount of flex and bend to the instrument to know when the tolerances are correct and tap for tone and response. This is a hands on process.

Authenticity is the all guiding principal with construction – Materials, tools, and methods of construction – which includes carving from the solid block for fiddles and other similar instruments. All these items are as close to period as can be determined. The examination of construction techniques from either period or as early as one can find examples (only a hand full or luthier class instruments exist and all but one is from a dig -- only one is complete in its original form so that it may be played -- a fourteenth century harp from Ireland). Study of luthier techniques from the Middle East and Eastern Europe also are windows to the past for authenticity.

Several items were purchased for the project - tuning pegs, strip marquetry (which I then matched and created other art from the basic strips), gut strings, and brass rod.

Other decoration is made by me – the rose, ivory and horn marquetry, ivory triangles inlays.

The wood:

before you start making anything you must choose the proper wood. Archeological remains and documents from the period, as well as luthier tradition give us a list of proper instrument woods. Fruit and nut woods, box wood, maple (English sycamore) and occasionally some exotics imported from Africa and India, black wood, rose wood, and related available exotics from these areas. Woods from the Americas is not available until the late Renaissance – such as birds eye maple, mountain mahogany, yellow box wood, palasander, kings wood, and pernambuco. The hard woods are for the box, neck and furnishings. The top, or table, is made of Spanish cedar (not red cedar) or spruce except on harps and psalteries where hard wood is used. **The top wood needs to be quarter sawn.** Thickness depends on the instrument being built, however, most are one eighth inch thick, not getting any thicker than three sixteenth of an inch on some larger instruments. The issue with using oak (surviving two rottas found out of oak) is that oak survives well due to the high tannin levels in the wood, but, is unstable – changes radically with humidity and climatic changes resulting in breakage, inability to keep in tune, and other undesirable results. Many rotta bridges have been found but the instruments were constructed of other woods that did not survive the ravages of time. Oak is not the only wood these instruments were made of and is not a good instrument wood – unless you intend on preserving it in a grave for a thousand years, then yes, by all means, use oak.

Burl – Luthiers do not use burl – period – the end. Burl is brittle, prone to cracks when thin, stiff and unresponsive to sound vibrations, and the grain does not run straight as is desired when quarter cut.

Flamed wood – Use of flamed and decorative wood grain in the luthier craft dates to the mid 16th century. The use of the decorative woods, seems to be assumed to be a time out of memory type of material for use in constructing musical instruments – **NOT SO!** The history of how, when and why this decorative wood came into use is known and well documented. In the Renaissance, 16th century, with the push of the Ottoman Empire, wood from Turkey (the major source of maple and other hard woods for Italy) was selected by the Turks for its wavy pattern – so the oars for Italy's war galleys would be weak, and more likely to break. This wood with the wavy grain was also the source for the Italian luthiers. The Italian instruments had the highest esteem and reputation influencing luthiers in other countries to emulate the choice of wood for the wavy grain and decorative wood. The use of these woods earlier than 1550 is not common – only accidental. It is completely unhistorical and unwarranted to use these decorative woods for instruments of the Middle Ages. (E.D. Heron-Allen VIOLIN-MAKING: AS IT WAS AND IS (Ward, Lock & Co. Limited London and Melbourne 1885 sec ed. 1861 first ed.) (Book in private collection of the author).

These are not furniture woods, nor are they woods for any other purpose in general. Luthier woods are in a class by themselves sometimes using species atypical to any other use. One cannot assume, for example, that the advent of cherry wood use in furniture in the Middle Ages is a sign post for when it was used for musical instruments. Since a Fyddle uses much less wood than, lets say, a chair, or bed, a small supply of the precious wood would be secured by the luthier first – the carpenter would only gain access to it for his larger projects as the supply grew.

To assume that cherry wood, for example, did not enter into use in the Middle Ages until the 14th century because existent artifact furniture made of cherry does not predate the 14th century would show flawed logic. **First**, not all furniture from the Middle Ages has survived, in fact precious little. **Second**, because artifacts from the 14th century, that have survived have cherry wood do exist does not mean the cherry wood started use in furniture in the 14th century, only that some artifacts made of the wood survived from that period. **Third**, artifacts from earlier periods are increasingly rare, and furniture using cherry might have been made but, not survived. **Fourth**, we are talking furniture artifacts here not musical instruments – luthiers have always sought out and obtained the best wood. **Since cherry, maple, and walnut, are the most suitable instrument making woods readily available, and they match reasonably close the European medieval woods available in period, it is reasonable to use them for authentic recreations of medieval musical instruments. (See Appendix B)**

The above list of woods are good for recreations of medieval musical instruments and available equivalents in non European varieties (American cherry, maple, walnut) are in many cases all the American luthier can get.

Patching, when necessary is done with a mixture of glue and very fine sawdust made into a paste.

The design must withstand 404 pounds of pressure per square inch pull between the bridges resulting from 38 strings tuned diatonically starting with low F. This is a traditional harp - psaltery -- tuning from which certain notes may be sharpened or flattened to adjust to the mode of the song being played.

Perhaps it seems obvious how to set up the bridges and make this instrument playable and functional – it was not. I worked with design ideas for several months, considering holes through the bridges, and such til I came to accept the pin bridge roll concept. The detail of how this was done is not clearly shown and required much innovation and design brain storming to arrive at a working model. I am working from scratch to recreate a musical instrument not seen for seven hundred years. except in an illumination. This requires creativity and knowledge of luthering techniques as well as extensive research. What may appear obvious to the casual observer of the finished instrument was not obvious at all. The design was challenging and presented some real problems that needed creative solutions.

“The system of tuning was diatonic, never chromatic, and restricted the instrument to one mode or basic scale at a time.”

“Although the tuning of both psaltery and dulcimer was invariably diatonic during the Middle Ages, the compass and number of strings varied enormously.” (David Munrow, *Instruments of the Middle Ages and Renaissance*, Oxford University Press Music Department 44 Conduit Street London W1, 1976 pgs 21-24

Strings are died with a natural dye – red for C and blue for F – as is traditional, to ease playing. (Molly Duncan, *Spin, Dye & Weave your own Wool*, Sterling Publishing Co., Inc. New York, 1973)

madder

A natural red dye obtained from the root of Rubia tinctorium, a perennial herb with yellow flowers and a dark red berry that is cultivated in Europe and Asia Minor. Madder has been used as a colorant for dyeing textiles since ancient times in India, Persia and Egypt. The cultivation of madder along with its use in the complicated Turkey red dyeing process spread to Asia Minor about the 10th century; it was introduced into Europe by the 13th. A highly purified version of madder, called fleurs de garance, was produced in France in the 19th century. Madder dye contains three principle coloring components: alizarin (red), purpurin (red), and xanthin (yellow). The colors are extracted from the dried, powdered root as a precipitate when it is boiled in water. Alum lakes of madder (such as rose madder) were used as artists pigments. Madder forms a bright red color when precipitated on aluminum hydroxide. Tin, chromium, and iron mordants can produce purple, brown and pink colors.

About Indigo

Natural Indigo is perhaps the oldest dye known to man. The oldest historic texts speak of it, as in the colors chosen for the Tabernacle of the Arc of the Covenant. The oldest fragments of cloth are dyed with it. It is a dye known to all cultures of the world.

The top is made of light cherry (available and a reasonable wood from the selection above) selected for matching color and pattern one quarter inch thick, and the back of dark cherry selected for matching pattern and color (select figured wood) one eighth inch thick -- all quarter sawn.

The frame is of cherry with hard maple bridges for strength due to the large number of strings and the forces exerted on the body from them. Maple dowels were made and used to secure the bridges to the body (necessary due to the extreme pressures on them).

The rose is cut from one eighth inch maple in a historically accurate pattern. The face inlays are of ivory (old piano key ivory) and horn, hand made and inlaid in the thirteenth century style. Marquetry is chosen and overlaid in proper period style and decor. The research to find period roses and then draw them represents a great deal of time and development. These are not stock items available in some book or set of plans some place – I had to produce them from the illuminations myself. The roses are authentic, from illuminations.

Gut strings are used as indicated from original sources and tradition. Gut is still the choice for the Arabic qanon today.

Of interest is the cost of materials for this project. The strings alone cost \$200.00 and other expenses (\$150.00 for marquetry) (\$50 for piano key ivory) and so on, add up to a total of over \$400.00 - one of the more expensive instruments to make.

Wood: (European Cherry (Prunus avium))

Highly figured, select cherry wood split and jointed in numerous sections, one eighth of an inch thick (2 mm) make up the back. Joining wood well, so there are no gaps and the wood matches, is an art. It is common for the luthier to inlay marquetry strips between the joints to hide them, cover glue marks and joint gaps. The decision to not do this was based on the good joints I was able to get with this wood. Small imperfections (such as small amounts of glue marks in deep joint impressions) were insignificant compared to the overall effect of the project - the illumination showed no joint marquetry on the face which also influenced my decision. The project is to recreate this exact instrument, not some major departure from the original. In light

of this, only what is there in the illumination, or reasonable variation in period, is allowed.

Joining wood in the luthier arts is different than that of a carpenter or furniture maker. The wood on tops is usually two millimeters thick and must not be thinned more to get rid of deep small pockets of glue residue. That luxury is not a problem when constructing a table or whatever, when the boards are a centimeter or more thick. Good joinery in the luthier craft will still have some imperfections in this respect – since finishing is done by hand, not machine. This is why so many instruments have marquetry strips inlaid in their joints. An instrument without joint marquetry is strutting nice joints – small imperfections are accepted.

Cherry wood and hard maple make up the sides and bridges.

Cherry wood, Quarter sawn and select grade was chosen for the top – one quarter inch thick (4 mm) – matched and jointed for color and grain.

The rose is cut from hard maple – durable and an important sound amplification feature. A small hand drill (finger twisted, not mechanical not powered) is used to pierce the wood with tiny holes for the insertion of a jewelers saw. The saw is used to cut out the shapes in the design. Once cut, tiny files are used to finish the piece.

The model – one needs plans to construct an instrument. I make only medieval musical instruments. In the past I have made some Renaissance instruments but their construction is completely different than that of the Middle Ages. My interest and speciality is in instruments of the Middle Ages, therefore my information here is only for that time period.

Choose the instrument you wish to construct – get the manuscript picture or pictures – study as many variations of that instrument as can be found. Using knowledge of tuning and string lengths allowable for those pitches, get a max and min string length for the instrument. Now you are ready to measure the instrument in the drawing and enlarge it in proportion to the human figure holding it and matching the string lengths needed for a working instrument. I am always amazed that the dimensions I arrive at match the limitations of physics in string length requirements for a working musical instrument. The medieval artist draws the instrument in proportion to the human body -- so one can use the average five foot four to seven inch height to proportion the drawing and divine a size for the instrument.

I draw my plans first on large white or brown butcher paper, sold for wrapping packages for shipping and art etc. Once these plans are finished they are copied to poster board and a stiff template is made. Some times I also make the outlines in 1/8 inch plywood.

The template will be used to draw the body on the single block of wood chosen to become the new musical instrument body. The neck may be included in this or the neck may need to be attached separately to the body (always carve the neck attached to the body unless there is some reason – like the pegbox rises above the plane of the top of the ribs).

Once drawn the outline is cut. The body is ready to be shaped and finished to final contour on the outside. For this instrument, the frame is glued from 3 boards cut and fit to make the frame – as shown in the plans. The back is jointed and fit first, then glued. The top is jointed and fit, then glued. The rose is cut, fitted into the top (the top is cut) and the rose set. Then the bridges are glued and doweled. Now the instrument is ready for inlays and marquetry overlays. Finishing come now (see section on finishing details below) Tuning pins are set (holes drilled in the top side – placement determined with a template) Hitch pins are set and brass rod cut for the bridge rise. The strings come next.

Some might think the construction of such an instrument is obvious – NOT SO. If not constructed properly, the whole instrument will fail and pull apart – or at least buckle and warp under the stress. The research and experimentation required to build such an instrument is extensive. I have built 7 harps, 6 psalteries and have had one of each fail in different ways. This knowledge was important in arriving at the construction plans for this psaltery. If this was a first time instrument, many design flaws would probably exist leading to some failures in structure. This, I am confident, will not happen with this design. Experience, and research have led to this final design over many years of study – as has the research and skills in varnish and musical instrument finishes and all other instrument making skills gained over the last 30 years.

Mystic numbers, magic and golden circles – We have drawings from the luthiers of the 16th and 17th century indicating their use of golden circles and magic numbers in regard to designs. Numerology and mystical significance in numbers is well documented from the 11th century on. This tradition in the luthier arts is ancient and meaningful. Certain aspect ratios yield inner volumes of the body that produce a more resonant response to certain frequencies and balance over primary frequencies. String lengths are also absolute in nature – a certain pitch within a given register must be achieved with just the right string length and string diameter. There are limits of physics in dealing with strings and the luthier must know these and work with them in the model.

The following Table is from Craig H. Russell phd, Music of the Spheres: Love, Chivalry, and the Universe in the Twelfth Century M11404: Medieval Music – California Polytechnic State University San Luis Obispo

4 Seasons	Spring	Summer	Winter	Fall
4 Elements	Air	Fire	Water	Land
4 Winds	Meridiano (South)	Poniente (West)	Levante (North)	Tremontana (East)
4 Ages	Child	Youth	Maturity	Decrepit
4 Body Fluids	Blood	Cholera	Phlegm	Melancholic
4 Qualities	Hot & Humid	Hot & Dry	Cold & Humid	Cold & dry
4 Modes	Dorian	Phrygian	Lydian	Mixolydian

7 Planets	Sun	Moon	Mars	Mercury	Jupiter	Venus	Saturn
7 Days	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

7 Metals	Gold	Silver	Iron	Mercury	Tin	Copper	Lead
7 Organs	Heart	Brain	Gall Bladder	Lungs	Liver	Kidneys	Spleen
7 Qualities	Good, Noble	Melancholy	Ardent, Fiery	Variable, Inconstant	Benevolent, Natural	Creative, Good-Deeds	Distant, Cold
7 Virtues	Fortitude	Temperance	Justice	Hope	Faith	Love	Prudence
7 Note-Names	A	B	C	D	E	F	G

Music played an integral role in medieval philosophy and daily life. The concepts of love and chivalry are bound up in medieval philosophy and thus bound with music. Musical instruments are an embodiment of medieval philosophy and are instruments of love and chivalry. They must therefore be perfect, embodying the mysteries of the universe.

Tolerances – carving – musical instrument tolerances for tone– This is, for a master instrument, nothing less than high art – something one does not see, only hears. This is the dividing line between master and hack, yet people only see the outside. Some recent discoveries have shown that the 17th century masters use the sun to disclose unequal density in the wood and marked and scraped to even the density out. (Scientific American July 1989 - Stradivari’s Secret (Redux) Did baroque artisans “X-ray” wood with sunlight?) There is no reason to suspect this technology developed with the baroque masters since examination of existent renaissance instruments show the same knowledge of density mastering. Indeed, we have every reason to suspect that it reaches back to the medieval master luthiers. The problem is the lack of existent artifacts. Also certain areas are thinned for better response and others left a little thicker for strength and controlled responsiveness. The technology is as advanced as a high tech speaker system and a lot less quantifiable – relying on the art of the luthier master to get it right. This method of mastering an instrument is not born or originating in the 17th century – just carrying on a long tradition stretching back into the Middle Ages. This knowledge and master work is what you are paying for in a new master instrument of the violin family that costs over \$10,000.00. In general, the back is one eighth of an inch thick and the ribs are one eighth of an inch thick. These are starting points for the master, not finishing points.

Other Materials:

Ivory and horn make up the inlays on the face and around the rose. (Ivory from old piano keys – it is legal). Ivory for the pluctrum as well. Many exotic woods are represented in the marquetry which was purchased in strips and then combined to make unique period type marquetry for the psaltry. The strips are made in the same way they were in the Middle Ages..

Brass rod and pins are used for bridge risers and bridge pins.

Componants: All are period - glue, varnish, strings, everything.

Time to construct:

Estimated hours to complete this project – 300 -- 400 hours or more. Time is hard to keep track of when you work on an instrument off and on for over two years. Keeping this in mind, the times are only guessed at. We must not forget the time to design the instrument from the original sources. Drawing of working drawings and making jigs or models.

The rose is cut with a jewelers saw and takes about 80 hours alone.

The ivory and horn inlays are hand cut (piano key ivory) totaling 40 or more hours to make and inlay.

The body or the instrument is carefully hand dimensioned for proper tolerances using hand scrapers and chisels. Many many hours of work goes into this process to get it right – this is a master luthier art.

About three to six weeks of on and off time are required to properly finish the instrument in an authentic period style with period materials. (100 hrs at least). Varnish from period recipes must be made (time here is unknown but perhaps 30 hours to make varnish) and applied – not as is done with furniture which would spoil a musical instrument – but, with knowledge of the luther craft and arts.

Varnish is made from period recipes and required extensive research and development to execute, and learned skills to properly apply. Boiled linseed oil, turpentine (from pine sap), pine resin (best source is pure violin rosin), and saffron, are the component of the varnish I prefer.

Knowledge of the construction is derived from, not only period illuminations, but from an existing instrument dating 1650 in this author's collection. Such details as a heavier top board and a thin underbelly sound board construction are noted from this instrument. Although later than the time period of the reconstruction (1260), the method of construction in the 1650 instrument is clearly of a long standing tradition and shows a most reasonable path to the past. This could not be said of all musical instruments from this time period, such as the 1650 violin I have. The construction of that instrument is fundamentally different than instruments of the Middle Ages.

Metal tuning pins are used, as were the ones on the original. Metal tuning pins on zither and harp type instruments have been documented in use since the 6th century – documented with archeological finds on rotas. Iron, and soft bronze as well as brass are known to be used. The “T” shaped tuning wrench being used by the left side figure in the Cantigas illumination argues for metal tuning pegs very successfully -- as the number of pins argues for the number of strings.

Brass hitch pins are used for string guides and hitch pins.

The over all instrument is seen as an art object as well as a functional musical instrument. The level of decoration is in accord with a noble or royal house.

The finish is an oil based period musical instrument quality varnish. About thirty coats of varnish are required to achieve the high luster and polish. **No modern plastic or resin finishes are used.** Modern violins, violas and cellos are the only instruments commonly found using oil varnish today, and only the most expensive of those in the \$10,000.00 and up price range. The labor, in such a finish, greatly adds to the price of an instrument. Thirty coats of oil varnish with drying time between each coat and hand rubbing of each results in a nice but labor and time intensive finish.

Finishing – surface prep sealer, oil varnish, and polish – The arcane art of finishing a

luthier family instrument and the mystic surrounding this process is legendary. This process is not the same as for finishing furniture. A musical instrument wood must remain unspoiled and untainted so it can develop. The cells of the wood contain pitch. As this pitch dries it crystalizes and leaves the cell nearly empty. This is why instrument makers pay large prices for aged wood, and is one of several reasons that in instrument gains tone and voice as it ages. This process takes about seventy to one hundred and fifty years to achieve. Certain treatments enhance and strip the pitch from the cells – wood allowed to soak in the bay of Verona for two to ten years allowed tiny microscopic sea animals to eat the pitch out of the cells. Some wood cut a century ago in Michigan, sank into the great lakes and was rediscovered recently. This wood, from the lake, also has the property of empty cells and is drawing a big price from luthiers. If you pay a big price or not, one does not want to spoil the potential of an instrument by gumming it up with oils or other foreign substances. **The surface of the wood must be sealed, to prevent contamination of the cells.** Sealing is done in one of three ways:

1. Coating the surface with a thin coat of instrument making glue.
2. Using a shellac. (Spirit based component that seals and does not sink in the wood)
3. Using sizing.

I prefer the shellac sealant over the other two options – the glue is not as good at preserving a clear vision of the wood (gets cloudy or dark) tends to be brittle and hard too – the sizing does not stick well to the oil varnish and it tends to sluff off or become goeey over time. Once the surface is sealed, the oil finish can be applied. Here is a listing of period recipes for instrument grade varnishes along with the source. I have experimented with some of these and have developed what I find to be a good varnish for musical instruments out of this information and some other source books I have on 16th century violin varnish. These are as early as the documentation on varnish gets.

The following is from VIOLIN-MAKING: AS IT WAS AND IS by E.D. Heron-Allen (Ward, Lock & Co. Limited London and Melbourne 1885 sec ed.)
THE VARNISH.

All the data we have to go upon are the printed works of some few individuals, who have written pamphlets on the various varnishes in common use for various purposes, and it is not unreasonable to suppose that the varnish used by the luthiers or fiddle-makers, was, to a certain extent, familiar to them ; again, the reading and proper construction of these formula is rendered more difficult by the fact that many of the gums, resins, and solvents mentioned, no longer exist under the names by which they were then known, and some would seem almost entirely to have disappeared. I will now recapitulate a few of the most likely formula enumerated in these ancient brochures. The first I have been able to obtain is a treatise called "Secrets of the Arts," first published in 1550, by one Alexis, a Piedmontese. He gives the following recipes:—

1. Place some powdered benzoin (a) in a phial and cover it with two or three fingers depth of pure spirits of wine, and leave it thus for two or three days. Into this ~ phial of spirits, put five or six threads of saffron (b) whole, or roughly broken up. With this you may varnish anything a golden colour, which will glitter and last for years.
2. Take white resin (vide note) 1 lb., plum tree gum 2 ozs., Venetian turpentine (c) 1 oz., linseed oil 2 ozs.; break up the resin and melt it. Dissolve the gum in common oil and pour it into the resin, then add the turpentine and oil, and placing it on a light fire, let it thoroughly mix; remove and keep for use; apply

slightly warmed. This is a good picture varnish.

Under this head would come a kind of copal, known variously as "Indian copal," "dammar," and "gum animi," which flows from a Sumatran tree called *Vateria indiccz*, which was, in former times, known as "white amber" or "white resin," or "white incense," which names were also given to a mixture of oil and Grecian wax, sometimes used as a varnish.

As the names of many of these gums, etc., may be unfamiliar to lay readers, I have placed an Appendix, descriptive of them, at the end of the book (Appendix A.), and the reference letters in the text refer thereto.

D. Alexii Pedemontani de Secrets Libri Septum. (Basle, 1603.)

3. A quickly drying varnish. Take frankincense (d) and juniper gum, powder them and mix them finely. Take some Venetian turpentine, melt it in a little vessel, and add gradually, mixing thoroughly, the aforesaid powders. Filter through cloth and preserve; apply warm, and it will dry very rapidly.

4. Take gum-mastic (e) 2 ozs., Venetian turpentine 1 oz., melt the mastic on a light fire, adding the turpentine, let it boil for some time, mixing them continuously, but not long enough for the varnish to become too thick. Put it away out of the dust. To use it, warm it in the sun and lay it on with the hand.

5. Boil 3 lbs. of linseed oil till it scorches a feather put into it, then add 8 ozs. juniper gum and 4 ozs. aloes hepatica (~, and thoroughly mix them; filter through cloth, and before using, warm in the sun.

6. Gum-mastic 2 ozs., gum-juniper 2 ozs., linseed oil 3 ozs., spirits of wine 3 ozs., boil in a closed vessel for an hour.

The author cites as colouring matters, sandal wood (g), dragon's blood (h), madder (i) steeped in tartaric acid, log-wood (j), Brazil wood (k), all dissolved in potassa lye, and alum, and boiled. Also saffron (b), cinnabar (l), and orpiment (in). He says, "Linseed oil will dissolve mineral and vegetable colours, but kills others."

Fioravanti in a brochure called "The Universal Mirror of Arts and Sciences," published at Bologna in 1564, gives the four following formula

1. Linseed oil 4 parts, spirits of turpentine 2 pts., aloes 1 pt., juniper gum 1 pt.

2. Powder, benzoin, juniper gum, and gum-mastic, and dissolve in spirits of wine. This varnish dries at once.

3. Linseed oil 1 pt., white resin (vide note, p. 173) 3 pts., boil together, and colour as you will.

4. Linseed oil 1 pt., resin 2 pts., pine resin ~. pt., boil till it thickens. Juniper gum must never be added to the linseed oil till it boils, or else it will be burnt. The oil should be boiled till it scorches a feather dipped into it.

He gives the same directions as Alexis, as to colours, and the solvent powers of linseed oil.

Beyond these two authors, formulae become rather scarce, being chiefly brought from China. All these last, and the coming, formulae are not to be taken as invented at the dates given, for they are from works in the nature of Encyclopedias, and consequently post-dated.

A priest of the name of Anda, in a pamphlet entitled "Recueil abrégé des Secrets Merveilleux," published in 1663, gives the following recipe:—Oil of turpentine 2 ozs., turpentine 1 ox., juniper gum ~ dram; to be mixed over a slow fire.

One, Zahn, in 1685, in "Oculus Artificialis," vol. iii., p. 166, gives two recipes:—

1. Elemi(n), anime (o), white incense, and tender copal (p),

2 drains each; powder and dissolve in acetic acid in a glass vessel, adding 2 drains of gum tragacanth (q) and 4 drains crystallized sugar; dry off this mixture and powder finely. Take 1 lb. of oil of lavender (r) or turpentine and 6 ozs. Cyprian turpentine (s), and boil them on a water bath. When the turpentine is well dissolved add the powder and mix thoroughly; boil for three hours.

2. Oil of lavender 2 ozs., gum-mastic 1 oz., gum-juniper 1 ox., turpentine ~ ox.; powder the mastic and juniper, and boil the oil, then add the turpentine, and when dissolved add the powders and mix thoroughly.

The Rev. Christopher Morley in 1692, in "Collectana Chinictea Lydensia," gives under the name of "Italian varnish," the following recipe

Take 8 ozs. turpentine and boil on a fire till it evaporates down to 1 oz.; powder when cold, and dissolve in warm oil of turpentine. Filter through a cloth before use.

And, lastly, a Jesuit, named Bonanni, in his "Traité des Vernis," published at Rome in 1713, gives a list of substances used, in which he includes—1, Gum-lac in sticks, tears, or tablets (i); 2, Sandarac (u) or juniper gum; 3, Spanish or American copal, hard and soft; 4, Amber (v); 5, Asphalte (w); 6, Calabrian resin or pitch; 7, A little-known gum which flows from the wild olive-tree, resembling red scammonium.

Besides these he mentions as gums not used for varnishes, elemi, anime, arabic (x), pear-tree, cherry -tree, azarole—tree (vide p. 131), and other tree gums. He also alludes to gamboge (y), incense, myrrh (z), oppopanax (a a), ammonia, oils, such as turpentine, copaiba (b b), etc. It will be observed that he omits benzoin, and mistakes when he classes amongst useless gums elemi and anime, which (especially the former) are much used for violin varnishes on account of their tender qualities, otherwise his list is practicably one of the modern ingredients of varnishes for all

1 Sandarach, or rather what is sold as such, is a mixture of the resin described in note s~, Appendix A, with dammar and hard Indian copal, the place of the African sandarach being sometimes taken by true gum juniper. These gums are insoluble (or nearly so) in alcohol, and consequently the sandarach (or pouucé~ of the shops) is useless to the violin-maker. True sandarach is the pure gum of the common juniper, and appears in the form of long yellowish dusty tears, and such you must see that you get. And for this reason I have always in this chapter made use of this term gum juniper in preference to the better known term sandarach purr~,~t a. He gives many formulai, the bases of which are principally mastic, juniper gum, copal, linseed oil, and oil of lavender. It would be easy to multiply these old formula, but space forbids it; the foregoing arc doubtless the most important and useful of them, as giving us a good idea of what materials the old Cremona varnishers had at hand; their varnishes, of course, had to be most carefully suited to their peculiar requirements, and properly to ascertain this it is necessary to find (a) what part it plays in the construction of a fiddle, and (b) what qualities it must consequently necessarily possess. L Abbe Sibire in "La Chelonomie" thus sums up its 'raison d'être

"IL faut que ces pates, parfaitement délayées, plus légères que massives, nourrissent los matériUx sans masquer leur vertu, et adoucissent les sons sans les obstruer. Ce no serait pas la peine d avoir pris tant de pr~cautions avec le compas [du violon], pour les annuler avec les drogues. Emaillez tant qu il vous plaira, mais n assourdissez pas. Quand je vous commande un violon, je souhaite qu il soit joli, mais j entends qu il soit hon ; et mon oreille, indignée et jalouse, ne vous pardonnerait pas d avoir, a ses dépens, travaillé pour mes yeux.

Translation of the French (" La Chelonomie " thus sums up its ' raison d'être " IT is necessary that this pates, perfectly diluted, lighter than massive, feeds los materials without masking their virtue, and eases sounds without blocking them. This no would be not the punishment(effort) d to have set so much precautions with the compass [of the violin], to cancel them with drugs.

Enamel so much that he(it) will please you, but n dim(deafen) not. When I command(order) you a violin, I wish whether he(it) is beautiful, but j listen whether he(it) is honey and my } (Thanks Bablefish)

Before beginning to consider the matter we must get rid of all notion of colouring the wood before varnishing, or staining it with acids and other corrosives to give the appearance of age and all such inventions of the Evil one, which acids sink right into the unprotected wood as into blotting-paper, and invading the innermost heart of the fiddle~ where they have no business to be, destroy its most sovereign qualities without performing any of the proper functions of varnish. Its first and great function is, of course, the preservation of the wood without it no fiddle could attain an age of more than a very few years, and the tone would lose sweetness and power after a very short existence of harmony. On its nature also a great La1 depends: it must be tender, in a manner soft; that. ~s, it must yield to the movements of the wood, and not encase the fiddle like a film of rigid glass. It is well known that in hot weather the wood expands, and in cold weather contracts on a violin, imperceptibly perhaps, but none the less actually, and the nature and quality of the varnish must be such as to allow of its following these movements of the wood to which it is applied, without checking them in any way, as it certainly would if it were too hard. It is this that gives the oil varnishes such a vast superiority over spirit varnishes, though the former are more difficult to compound and apply, and take weeks, months (nay, years), to dry properly. Gum-lao has this same

hardening effect upon varnishes, though it has been most freely and disastrously used, in the recipes given below I have specially excluded all such, and all spirit varnishes. To obtain this suppleness, the gums must be dissolved in some liquid not highly volatile like spirit, but one which mixes with them in substance permanently, to counteract their own extreme friability. Such are the essences of lavender, rosemary, and turpentine, combined with linseed oil.

If these conditions are borne in mind, a glance at the above formula will show that they are all adapted for application to musical instruments in a greater or lesser degree, though most of them would require, at any rate, diluting. For instance, among those of Alexis, the Piedmontese, No. 1 is hardly more than a stain, and would require the addition of gum mastic and juniper to give it consistency. No. 2 would be tender, but too heavy; the same remark applies to Nos. 3 and 4; they all require diluting with essence of turpentine, and so on throughout. A moment's consideration of each will suggest the dilution or alteration required to make it useful for the purposes of the fiddle-maker. Again, by a looseness of diction the old masters have been cited as covering their fiddles with an "oil-varnish," without stating whether the oil employed were an oil properly so called (as linseed oil and the like) or an essential oil (such as oil of turpentine). It has appeared in the foregoing remarks that the old varnishers used to begin by boiling their oils to an extent sufficient to render them siccative, and then after cooling they mixed in the necessary powders, having re-heated the oil to a lesser degree, otherwise the high temperature necessary to boil the oil would burn the delicate resins and gums which they employed. And in this they differed from the manner in which the hard glassy spirit varnishes of to-day are made.

M. Savart has made the extraordinary mistake of preferring a hard spirit varnish of gum-lao, but it is difficult to imagine by what circuitous route he can have arrived at such an erroneous conclusion. It has been said that Stradivarius and his predecessors varnished with amber, but strong evidence against this is brought by the fact, that the secret of dissolving amber and hard copal was not known until 1744, when Letteis patent for the discovery were granted to one Martin. His operation was to fuse amber and hard copal by dry heat, and dissolve it in boiling oil, which was diluted with an essence raised to the same heat before it was added. This operation was, indeed, invented in 1737, but as this was the year in which Stradivarius died, he could never have used it, much less his predecessors, as stated by Otto, and besides, a varnish so compounded would be much too hard to use on violins for the reasons before stated.

Setup the art of making the instrument playable – Now we consider the height of the bridge, the fit of the nut and cutting of the grooves in the nut and bridge. The relationship of the strings to the fingerboard, frets, tailpiece and end-pin. Again, we are faced with art as well as knowledge. The tolerances differ for differing types of instruments and whether it has frets or not, bowed, or plucked. I use a tuner to tune the instrument once strung and then carefully place each fret in perfect tune. Frets are not inset as they are on modern instruments – some are tied gut, others are strips of wood, metal, ivory, or horn, glued to the fingerboard.

The string distance from the fingerboard at the nut is variable, depending on the type of instrument, but runs about 1/32 of an inch in general (this is simplistic but I am trying to give some reference tolerance for beginners to work from). The cut of the nut should not be too tall with deep grooves, but only tall enough to allow the strings to fall into a groove and hold. Too much nut above that can cause buzzing and poor appearance as well as breakage of the strings.

The strings must not be too close to the fingerboard or sounding board, nor too far away, and travel evenly along the board only widening the space slightly by the end toward the bridge. If too close, they buzz. If too high, they are difficult to play and cause the performer to slow, fumble and have pain. A good instrument is easy to play. This relationship is achieved by adjusting the nut, bridge and fingerboard. It is an art and craft that takes time to master. If at first you have difficulty, keep working with it. First discover what needs to change to make it right. Care and patience will reward you with a fine playable instrument.

The use of gut strings changes a set up greatly – increased space for more elastic and vigorous vibration must be considered to prevent the string from hitting the sounding or finger board.

Finger boards are shown to be for all intents and purposes flat with very little curve if any – this practice of curving the board is late Renaissance and only in mild amounts – we do not see curvature on finger boards as in the violin family until the late 18th century. Existing baroque finger boards on these instruments are nearly flat and very different than the modern setup. Seeing an early violin does not help unless it remains unchanged from the original short straight (non slanted neck) along with the wedge finger board. The finger boards on my fiddles are correct and do not show my lack of craftsmanship (I have made the curved finger boards on Baroque gambas). The surviving instruments in traditional cultures today are also constructed in similar fashion and this evidence must be considered.

The luthier craft is a complex one, requiring a knowledge of many special skills and concepts. In light of this, a carpenter, wood carver, or cabinet furniture maker does not have these skill, and cannot have them without years of person to person apprenticeship such as I had with Mr. Johnston (age 89 in 1972) 1972-1974, Mr Peterson (age 92 in 1984) 1982-1984) and Mr. D. Jones 1992-1993. The choice of the wood, the cut of the wood, the feel, bend, tone tap response, as well as the proper set up and tension are all highly guarded craft secretes. These things are also not easily imparted to words in a book or and not able to be imparted due to the hands on complexity of the subject.

As to choice of woods – again – the most reasonable match to period types -- that are *available* – are used for my instruments. Just because one does not see cherry wood in medieval furniture til the 14th century does not mean it is not used earlier in musical instrument building. Woods not seen at all in furniture are used in instrument building including ebony.

Authenticity:

Medieval musical instruments, made by me, have been displayed in several museums and are in the collections of several major universities, early music departments, including San Diego State University and Stanford. They are regarded as the most accurate reconstructions of these instruments in the world. My work is accepted and known in academic circles including two presentations at the Kalamazoo Medieval Congress.

Playing This Instrument:

This is not a harp! Harp technique is not correct and the sound of the instrument cannot be brought out with harp plucking. The period illuminations all show use of pluctrums as well as do the qanon players of the Middle East today. The strings are not plucked in the center of the instrument, but at or near the rear long bridge – struck with a pluctrum. Anything less will not show off the volume and proper voice of this instrument. The maker also objects to unskilled (in this instrument) musicians trying to demonstrate the instrument for judging. Someone who can play a mountain dulcimer (for and example) or the harp (another example) is not skilled in this instrument, or any other I build, and cannot be used to demonstrate or give input on the playability of this instrument. The instrument requires study in qanon style and technique and only someone with that skill can play the instrument for proper evaluation. It is possible for an unskilled (in this instrument) musician to actually damage the instrument or break strings.

It is critical that the instrument be held, as in the illumination, taking care not to rest any part of the body against the back. The back is the primary sounding board and must be unmuffled, unhindered, for the instrument to speak properly. The left hand holds the front side (not the top sounding board but the pillar side between the short bridge and the long bridge) of the instrument while the long bridge side rests toward the musicians body. The left arm must be kept away from the back sounding board, not rested against it.

Luthier means string instrument maker – luthier comes from luth, a medieval word shift from al oud or oud – the medieval lute. Literally, a luthier is a lute maker.

Few people in the SCA have taken on the luthier arts due to the enormous scope and daunting learning curve as well as the ample tooling and material costs. I have seen simple instruments made, such as rottas, and mountain dulcimers (most from kits and purchased plans), but the complex ones? -- no. This documentation cannot teach one to be a luthier. It is hoped that my thirty + years of experience and knowledge show in the final project and the documentation demonstrate just how authentic the instrument is. My plans are drawn by me from the

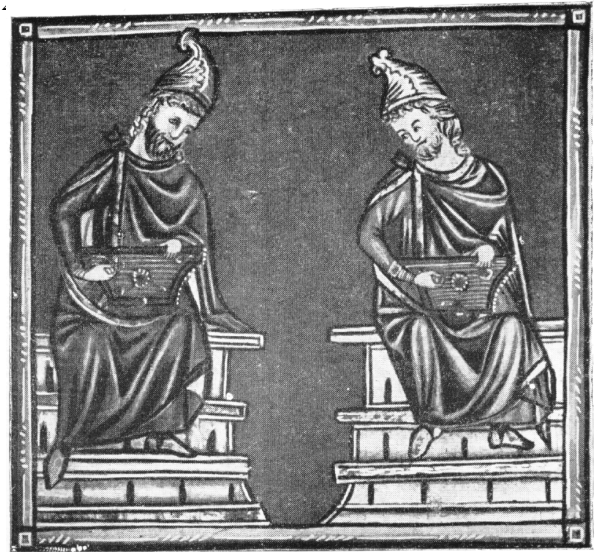


This project psaltery type is shown here on the 12th century cathedral of Santiago de Compostella portal. This only shows stringed musical instruments. This type of psaltery is older than some of the other types. It resembles some of the instruments of the ancient world.



illuminations. My instruments are built by me, from the basic materials. The instruments play well, sound good, and are museum quality (evidenced by their presence in museums).

Again – NOTE THE THICKNESS – about 2 inches thick.



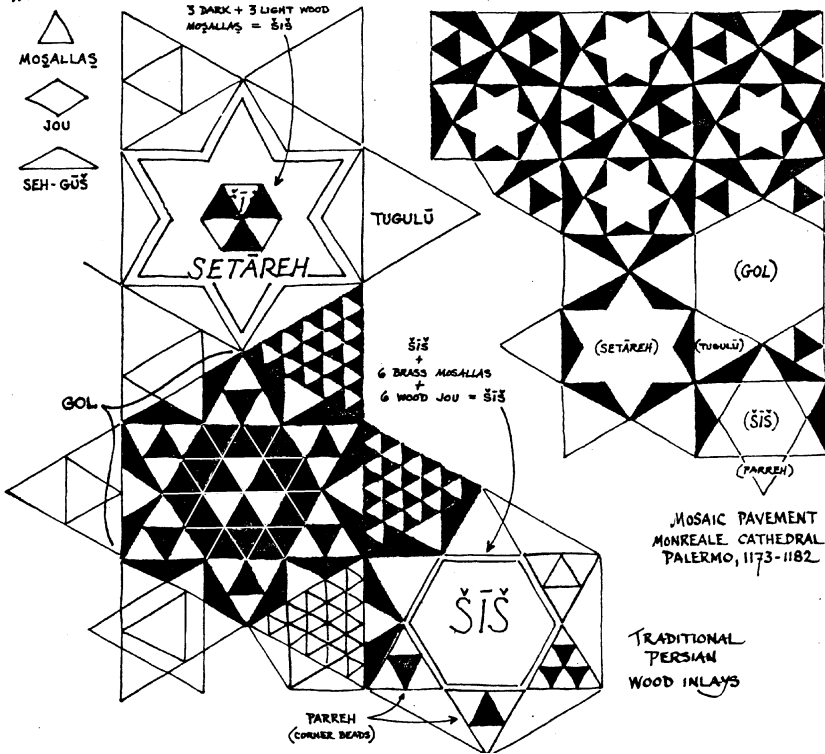
Cantigas de Santa Maria illuminations of psalteries other than the project.



Decoration and design ideas filtered from the Moors and Arabs in Spain. These are 13th century wall panels and floors showing use of geometric shapes to form design elements. 13th century Arabic wall panel showing elements of marquetry.



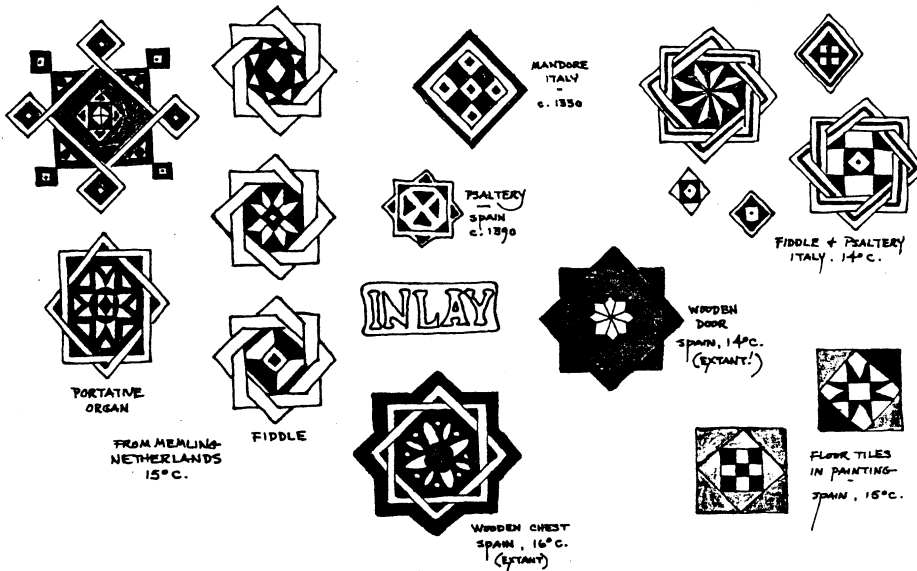
1A



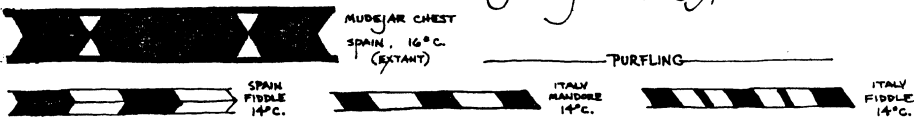
13th century mosaic tile technique provide many forms of artistic expression in floors, walls, furniture, ceilings, and musical instruments.

13th century arabic floor. (Above) Note the similarity in design and technique to the documented inlays on the left.

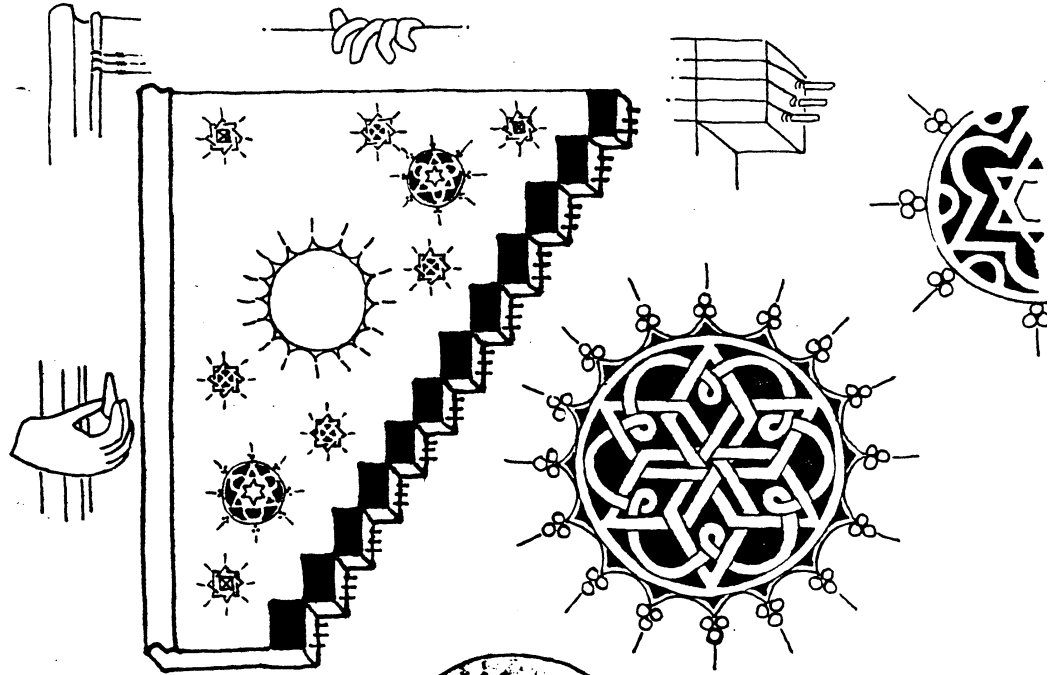
21



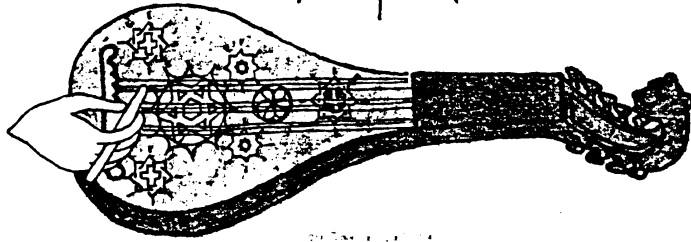
In Christian Spain, in the late 12th and early 13th century, marquetry techniques with ivory inlays developed, following methods similar to mosaic or inlaid tiling. J.M. Pita Andrade



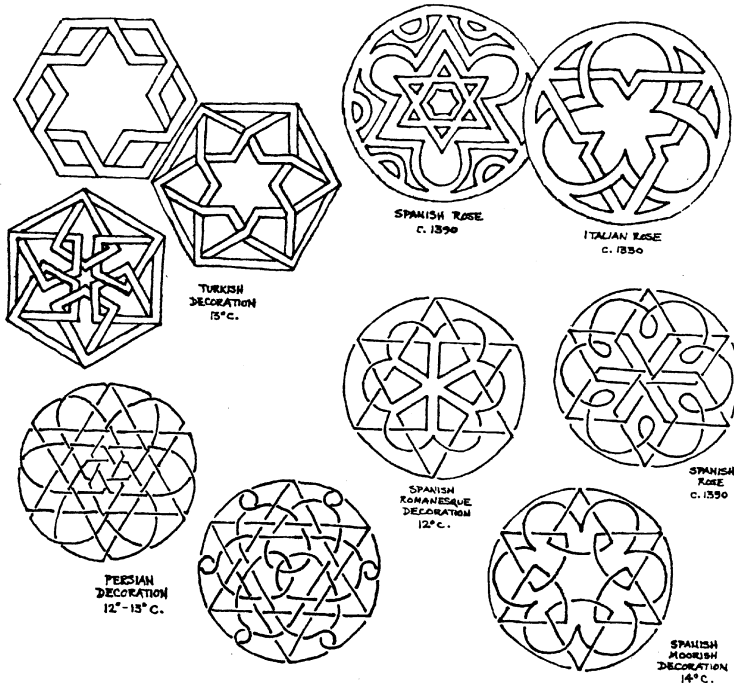
9



PSALTERY
and
MANDORE
from
TRIPTYCH of ANGEL MUSICIANS
(MONASTERIO DE PIEDRA)
— 1390 —



19



Documenting roses and details
of decor and design.

Some period references:

In Chaucer's Canterbury Tales the scholar Nicholas diverts himself with the 'gay saurrie' and the romance of Eger and Grime provides us with a charming account of a lady psaltery player:

*the ladye lovesome of hew and hyde
sett her downe by his bed side,
shee hyd a sowter upon her knee,
and theron shee played full love somlye.*

For further information see John Leach, "The Psaltery", *The Consort*, 27 (1971) pp.39-49

Appendix A

Cantiga Psaltry with 19 pairs of strings gut sizes selected to equalize tension as much as possible.

Course	Note	Tension Kgs	String Length	Gut string size
1	c''	1.30	10.6 cm	.500 mm
2	b''	1.84	13.9 cm	.475 mm
3	a''	2.01	17.2 cm	.450 mm
4	g''	2.02	20.5 cm	.425 mm
5	f''	1.91	23.8cm	.400 mm
6	e''	2.21	27.1 cm	.400 mm
7	d''	2.21	30.4 cm	.400 mm
8	c''	2.43	33.7 cm	.425 mm
9	b'	2.61	37 cm	.425 mm
10	a'	2.46	40.3 cm	.425 mm
11	g'	2.56	43.6 cm	.450 mm

12	f'	2.35	46.9 cm	.450 mm
13	e'	2.40	50.2 cm	.450 mm
14	d'	2.67	53.5 cm	.500 mm
15	c'	2.89	56.8 cm	.550 mm
16	b	2.88	60.1 cm	.550 mm
17	a	3.03	63.4 cm	.600 mm
18	g	3.12	66.7 cm	.650 mm
19	f	3.17	70 cm	.700 mm

Appendix B

The significance of the link between cherry wood and Mary is revealing in many ways. The clear association between her, cherry wood, and the miraculous, begs for a musical instrument body from this wood – it would have been mystical, and tied with symbology to the Virgin (an especially important fact in Spain at this time). Magical thinking is part and parcel of the medieval mind. I have established earlier the mystical importance of music in the fabric of life and culture of the Middle Ages – this is one more interesting piece of the puzzle and one that cries for the use of cherry wood on this musical instrument.

There are a few examples of paintings where Mary is linked to a cherry tree, for example, Master of "Paradiesgertelein" (1410) with Mary sitting between the tree of life bearing cherries and the tree of death without any fruit of any kind.

We know of a cherry tree in Kleinschadowite (Bohemia), victim of frost and ice in 1709, which budded forth and bore fruit after a Marian image had been affixed to its trunk. According to a Tyrolean legend (Bozen), Our Lady would have a special preference for cherry trees and chooses them for apparitions or as dwelling place for her image. Although without solid factual support, two hypotheses might be offered:

(1) A symbolic connection between life and fruitfulness of the cherry tree and Mary might be ventured

(2) In the history of devotion, trees are frequently mentioned as dwelling places of Marian images, either as place where they are found or where Our Lady wants the image to be affixed. The type of tree corresponds frequently to the local vegetation.

This page, maintained by The Marian Library/International Marian Research Institute,

*Dayton, Ohio 45469-1390, and created by C. Pfoutz was last modified Monday, 05-Feb-2001 09:33:14 EST by C. Pfoutz.
(<http://www.udayton.edu/mary/questions/yq2/yq262.html>)*

This is a wild naturally growing hardwood found in England and through out Europe. The Bing cherry is the fruit of the tree and is a crop grown in America as well. This variety was brought to the new world and planted far in advance of any oriental varieties. The forests from which cherry lumber comes are supporting large mature trees and the lumber is reasonable to assume to be the same as found in Europe since the tree is the same variety. The tree is a naturally occurring hardwood in the European forests, therefore available at all time periods. This cherry wood is available with the American cherry wood (the black cherry) – the difference in the wood is color – the American cherry being darker, almost black walnut in color while the European cherry is a warm red to light pink in color.

“Prunus avium - Wild Cherry, Gean. Irish Crann silin

Family - Rosaceae

Description

Small deciduous tree with round red fruit. Highly rated for timber. Height 20ft 5m. Age up to 200 years.

Habitat

Fertile soil but prefers none acid rich soils. Found in woods and hedgerows.

Natural Distribution

Throughout British Isles except Northern Scotland. Also most of Europe as far as the Urals.

The Tree Year

Flowers Leaves Fruit Ripen Fall

April/May April June

Propagation and Growth

Grown from seed. Deeply dormant treat as Acer campestre but start treatment as soon as collected for planting following April. Approx 4000 seeds per kg. Can be grown from cuttings from young trees.

Timber

Reddish brown wood.

Uses of Wood

Turnery, furniture, veneers, decorative paneling. Good firewood with fragrance of blossom as burns.

Food and Drink

The black fruit are edible. Birds quickly strip fruit from trees.

Related Species

Cultivated cherries derived from Prunus avium.

Also see Prunus padus”

<http://www.british-trees.com/guide/wildcherry.htm>

Name European Cherry (*Prunus avium*)

Type Hardwood.

Other Names Also known as cherry, wild cherry, gean, mazzard, merisier, and kers.

Sources Distributed throughout Europe and southeast Asia.

Appearance Generally straight grained with a fairly uniform texture and a rich luster. Light to dark reddish brown heartwood and narrow, nearly white sapwood. Often exhibits greater color contrast than American black cherry.

Physical Props Moderately hard and heavy, strong, stiff, and moderately stable in service.

Heartwood has moderate decay resistance. Steam-bends very well.

Working Props Machines well with both hand and machine tools. Turns quite satisfactorily.

Holds screws and nails well, glues and stains easily, and polishes to an excellent finish that naturally darkens with age.

Uses Highly prized for cabinets, furniture, carving, and turnery. Also used for paneling, decorative veneer, architectural woodwork, caskets, woodenware, novelties, musical instruments, gun stocks, handles, and toys.

http://www.woodbin.com/ref/wood/cherry_european.htm

Common Name: American Cherry, or *Prunus Serotina*

Other Names: American Black Cherry

American Cherrywood represents a small percentage of the vast forest resources of the East coast of the United States. Cherry trees of uneven ages are selectively cut, according to the prescribed norms and regulations governing environmental protection of the "Sustainable Forestry Initiative" or SFI - an initiative supported by the American timber industry to sustain this precious natural resource.

Most of the cherry trees grow in the forests of the Allegheny mountains, covering the states of Pennsylvania and New York. This species of wood has benefited enormously from the extensive reforestation program which began over a hundred years ago, when the forests were in danger of disappearing through over-cutting.

In 1900 the forest cover in Pennsylvania had been reduced to 10% caused by uncontrolled cutting of trees by the pioneer settlers for agricultural and then industrial development.

In 1904 a disastrous fire and widespread disease further weakened the forests. However, today thanks to sustainable forest management Pennsylvania, is one of the largest hardwood producing states, covering 68% of the territory.

American Black Cherry is in fact, one of the most sought-after species in architectural specification .

For further technical information free of charge contact the AHEC about American Cherry and other types of American hardwood *sciliegio americano* : www.ahec-europe.org

DISTRIBUTION

American Cherry is widely found throughout the East coast of the US. The main states in which this species of wood is commercially developed are in Pennsylvania, Virginia, West Virginia and the State of New York. Much of the cherry processed and exported by Canada is actually grown in USA.

GENERAL DESCRIPTION

The heartwood of cherry varies from rich red to reddish brown and will darken on exposure to light, while in contrast the sapwood is creamy white. The wood has a fine uniform straight grain, smooth texture, and may naturally contain brown pith flecks and small gum pockets.

WORKING PROPERTIES

Cherry is easy to process, nails and glues well. When sanded, it stains and polishes very well. It produces an excellent smooth finish, and dries fairly quickly with moderately large shrinkage, but is dimensionally stable after kiln drying.

PHYSICAL PROPERTIES

The wood is of medium density with good wood bending properties. It has low stiffness and medium strength and is shock resistance.

DURABILITY

It is rated as resistant to heartwood decay.

AVAILABILITY

Widely available from European importers in a full range of specifications and grades as both lumber and veneer.

MAIN USES

Furniture and cabinet making, high class joinery, kitchen cabinets, moulding, panelling, flooring, doors, (veneer) boat interiors, musical instruments, turning and carving.

Average Weight: (12% C.U.) 561 Kg/m³

Average Volumetric Shrinkage: 9.2% Green to 6% M.C.)

Modulus of Elasticity: 10,274 MPa

Hardness: 4,226 N

<http://www.timberandmore.com/news/newsdettaglioeng.asp?IDART=1723&LINGUA=ENG>

SELECTED BIBLIOGRAPHY

Cantiga de Santa Maria manuscript illuminations in black and white from La Musica de Las Cantigas, Estudio Sobre Su Origen Y Naturalieza, con Reproducciones Fotograficas del texto y transcripcion moderna for Julian Ribera de las rr. aa. espanola y de la historia Madrid

Tipografia de la Revista de Archivos Olozaga, I. 1922

Cantiga de Santa Maria color illuminations from 1972 Moec musical instrument calendar (Germany) currently in the author's private collection.

Drawings from the author's own sketchbook (author's private collection)

David Munrow, *Instruments of the Middle Ages and Renaissance*, Oxford University Press Music Department 44 Conduit Street London WI, 1976 pgs 21-24

Prisse D' Avennes (Edited by) *Arabic Art in Color 141 designs and motifs on 50 Plates* Dover Publications, inc, New York, 1978

Some other illuminations from David Munrow *Instruments of the Middle Ages and Renaissance* Oxford University Press Music Department 44 Conduit Street London WI 1976

E.D. Heron-Allen *VIOLIN-MAKING: AS IT WAS AND IS* (Ward, Lock & Co. Limited London and Melbourne 1885 sec ed. 1861 first ed.) (Book in private collection of the author).

George Fry, F.L.S, F.C.S. *The Varnishes of the Italian Violin Makers of the Sixteenth Seventeenth and Eighteenth Centuries and their Influence on Tone* , Stevens & Sons, Limited 119 & 120 Chancery Lane London, 1901

Dietrich Kessler, *The Viol*

Sol Babitz, *How to restore the Viols & Violins of the Renaissance & Baroque Eras (First Correct Guide)*, Early Music Laboratory Bulletin # 13 & 14 - 1976 - 1977

d'Azevedo, Warren, ed. *The Traditional Artist in African Society*. Bloomington: Indiana University Press, 1973.

Baines, Anthony. *Bagpipes*. London: Oxford University Press, n.d.

Biebuyck, Daniel, ed. *Tradition and Creativity in Tribal Art*. Berkeley: University of California Press, 1973.

Briffault, Robert. *The Troubadours*. Bloomington: Indiana University Press, 1965.

Chaytor, H. J. *From Script to Print, an Introduction to Medieval Vernacular Literature*. London: Cambridge University Press, 1945.

Critnhfield, Richard. *The Golden Bowl Be Broken*. Bloomington: Indiana University Press, 1973.

Dart, Thurston. The Interpretation of Music. New York: Harper & Row, Publishers, Inc., 1963.

Farmer, Henry George. A History of Arabian Music to the XIIIth Century. London: Luzac & Company, Ltd., 1973.

al Faruqi, Lois Ibsen. An Annotated Glossary of Arabic Musical Terms. Westport, Connecticut: Greenwood Press, 1981.

Goody, Jack. The Domestication of the Savage Mind. London: Cambridge University Press, 1977.

_____, ed. Literacy in Traditional Societies. London: Cambridge University Press, 1968.

Huizinga, J. The Waning of the Middle Ages. Garden City, New York: Doubleday & Company, Inc., 1954.

Kaufmann, Walter. Musical References in the Chinese Classics. Detroit: Information Coordinators, Inc., 1976.

Lomax, Alan. Folk Song Style and Culture. New Brunswick, New Jersey: Transaction Books, 1968.

Lord, Albert B. The Singer of Tales. New York: Atheneum, 1955.

Patai, Raphael. The Arab Mind. New York: Charles Scribner's Sons, 1976.

Redfield, Robert. The Primitive World and Its Transformations. Ithaca, New York: Cornell University Press, 1953.

Sachs, Curt. "Primitive and Medieval Music: A Parallel." Journal of the American Musicological Society, XIII (1960), 43-49

_____. The Rise of Music in the Ancient World, East and West. New York: W. W. Norton & Company, 1943.

_____. The Wellsprings of Music. New York: McGraw-Hill Book Company, 1961.

Werf, Hendrik Van der. The Chansons of the Troubadours and Trouveres. Utrecht: A Costhcek's Uitgeversmaatschappij NV, 1972.

_____. "The Trouvere Chansons as Creations of a Notationless Musical Culture." Current Musicology, Spring, 1965.

Crane, Frederick. Extant Medieval Musical Instruments. University of Iowa Press: Iowa City,

1972..

Two Older and somewhat out of date texts:

Bessaraboff, Nicholas. *Ancient Musical Instruments*, Boston 1941.

Panum, H. *Stringed Instruments of the Middle Ages*. London, 1939.

And since some people asked, a short list of primary texts on instruments:

Johannes de Grocheo. *De Musica*. circa 1300.

Johannes Tinctoris. *De Inventione et Usu Musicae* from about 1487.