



ESCUELA
DE
VIOERÍA



Didactic Guide: IO3- Instrument Building. Interpretation of organological sources.



ESCUELA
DE
VIOLERÍA

SUMMARY SHEET

Name of the project: Delyramus et Laboramus

Entity/Person submitting: Javier Martínez González, Director of the School of Violinmaking

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Twitter / Facebook / Instagram of the entity: www.escueladevioleros.com; www.vihuela.com; <https://delyramus.eu/>



<https://www.facebook.com/sharer/sharer.php?u=escueladevioleros>



<https://www.instagram.com/escueladevioleros>

<https://www.instagram.com/delyramus/?hl=es>



<https://www.youtube.com/watch?v=OYmD4iW66Oc>

<http://best-hashtags.com/hashtag/europeforculture/>

Along the lines advocated and valued by UNESCO on the transmission of intangible heritage to future generations, the Violinmaking School of Zaragoza is an initiative that seeks the recovery of Aragon's organological heritage and the training of new generations of violinists. It investigates techniques, procedures, postulates, materials and tools as part of this same legacy that deserves to be preserved. It joins to these functions, aspirations of social responsibility by integrating in the School's project groups at risk of social exclusion.

Awards received:

* The Musas Música Museos project (2011-2012) achieved the highest score of those presented for activities in museums throughout Spain (in collaboration with the Museo Nacional de Escultura, the Museo Lázaro Galdiano, the Museo Santa Cruz de Toledo, the Museo de Bella Artes de Valencia, the Museo de Zaragoza and the Real Academia de la Historia). https://youtu.be/y_VTiI4jzsM.

* The school's director was awarded the Tenerife Prize for the Promotion and Research of Crafts in Spain and Latin America. 2018 <https://premiotenerife.com/javier-martinez-gonzalez-premio-tenerife-2018/>;

* As well as the 2017 SICA award, <http://mrzaragoza.es/archivos/630>;

* The Ministry of Culture rated the Arte de Violería project as one of the five best rated among the 467 submitted to the 2018 call for proposals., <http://www.culturaydeporte.gob.es/ca/cultura/industrias-culturales/mejores-proyectos/accion-2019/arte-de-violeria.html>;

* *Business Cup Spain selected the Escuela de Violería as one of the ten finalists for the 2020 call, for its innovation capacity.* <https://bluered.es/innovaaccion/creative-business-cup-spain-finalistas>

* The director of the School of Violería received the Extraordinary Doctorate Award in Art History (UNED-University of Zaragoza) 2016. <http://e-spacio.uned.es/fez/view/tesisuned:GeoHis-Jmartinez>

* The School of Violería, finalist in the National Crafts Award 2021.

* First Prize of the Philharmonic Society of Zaragoza 2022.

* Declaration of the School of Violería in the Craft Code of Interreg as an example of good practice, at the request of the CRAFT CODE program promoted by the Municipality of Florence.

* National Crafts Award 2022, Private Entities modality.

Other noteworthy recognitions:

* Special mention to the School of Violinmaking in the file for the initiation of the declaration as BIC of the legacy of the Aragonese violinmakers.

European projects in which it participates:

Delyramus (ERASMUS+), together with Spanish, Italian and Portuguese partners.

Agreements with:

Institute of Historical Heritage - University of Zaragoza.

Monastery of the Canonesses of the Holy Sepulchre.

National Sculpture Museum; Sephardic Museum; San Pío V Museum of Fine Arts of Valencia; Lázaro Galdiano Museum; Santa Cruz Museum of Toledo; Museum of Zaragoza.

SUMMARY:

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I.- INITIAL SHEET WITH THE OBJECTIVES OF THE TRAINING MODULE.

ORGANIZATION Asociación Cultural Muslyramus (Escuela Violería) - ACM
INTELECTUAL PRODUCT O3 Training Module (Instrument Building + Interpretation of organological sources)
NAME OF THE ACTIVITY Development of a training module aimed at training adults in the construction of traditional Iberian instruments.
OBJECTIVES <ol style="list-style-type: none">1. To fill a gap in the official Spanish educational system, which does not provide for this type of education.2. To maintain a historical artistic and artisan tradition.3. To guarantee the quality of the musical instruments destined to professional musicians.4. To lay the foundations of a scientific methodology in the recovery of some ancient instruments of Iberian origin.
METHODOLOGY We explain step by step the methodological process that we will apply. <ol style="list-style-type: none">1) We start from the state of the art of the proposals for the recovery of historical instruments published so far.2) The compilation of the previous publications will be subjected to a critical analysis.3) To the results of the mentioned investigations, the contributions of our own investigations will be added, concluding with concrete proposals.4) Professional musicians and music teachers, performers of these same instruments, will be invited to contribute their particular vision on the results obtained.5) The resulting contents will be translated into texts, drawings, photographs, videos and planimetry adapted to the educational process, in order to create the first methods of construction of the reference instruments.
CONTENTS <ol style="list-style-type: none">1.- Writing of the texts for the construction manuals of the three most representative stringed musical instruments of the music of our Golden Age: hand vihuela, bow vihuela and double order harp.2.- Definition of the processes of elaboration of tools and auxiliary tools in the processes of inlay and lacquer work.3.-Turning processes applied to the construction of musical instruments

4.- Explanatory videos of the main construction processes of these same instruments. Pablo Soriano, Presen Mangado and Javier Martínez.

5.- Planimetry, development in autocad of these same musical instruments, with proposals of six different models: (vihuela with flat hand, vihuela with grooved hand; vihuela with oval body with Aragonese waist and vihuela with raised shoulders; baroque harp (model of the Museo Nacional del Traje); baroque harp (model of the Museo Nacional de Antropología)

6.- Multidisciplinary course on materials, with the participation of biology and ecology professors from different universities, musicologists and luthiers.

EVALUATION

Evaluate the results on a quarterly basis, comparing them with the forecasts included in our own calendar, in which the quarterly objectives will be reflected.

During the last two quarters, evaluate the method itself, using it as a learning manual with fifteen students, before writing the final document.

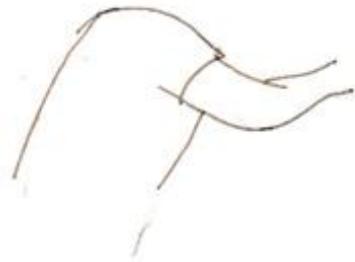
DISSEMINATION

The project will be disseminated, firstly, through the program Longitud de Onda (RTVE).

An informative documentary, broadcasted on television, will show the importance of the Aragonese violería during the Renaissance.

We will send at least one news item to the Delyramus project website and one every month to the project's social networks.

We will use the usual channels on the internet, our own website and social networks.



II.- DEGREE OF FULFILLMENT OF OBJECTIVES

The initial objectives were the following:

- 1.- To fill a gap in the official Spanish educational system, which does not contemplate this type of teaching.*
- 2.- To maintain a historical artistic and artisan tradition.*
- 3.- To guarantee the quality of the musical instruments destined to professional musicians.*
- 4.- To lay the foundations of a scientific methodology in the recovery of some antique instruments of Iberian origin.*

All of them have been successfully achieved, as can be seen from the content of the following points that complement this report. We briefly summarize the degree of compliance with each of these points:

- 1.- To fill a gap in the official Spanish educational system, which does not provide for this type of teaching.*

There are many lutherie schools, some of them associated or included in universities. The country where there are more schools or training centers of this type is Italy, all of them have an official title. The best known is the Scuola Internazionale di Liuteria A. Stradivari, located in the Palazzo Raimondi in Cremona. In the same city is the Accademia Cremonensis, located in Palazzo Mina Bolzesi, in the very center of the city. These centers were created to rescue the tradition of that city in the construction of violins, and today it is the best known school in the world. Thanks to their work, UNESCO declared the Cremonese violinmaking as a World Heritage Site. Other important Italian centers are the Civica Scuola Di Liuteria in Milan and the Scuola Internazionale di Liuteria di Parma.

In Germany, the Staatliche Berufsfach-und Fachschule für Geigenbau und Zupfinstrumentenmacher in Mittenwald stands out, but there are other important centers: Berufliches Schulzentrum (BSZ) für Technik Oelsnitz, Klingenthal; Studiengang Musikinstrumentenbau Markneukirchen, under the University of Applied Sciences Markneukirchen; Germany.

Mirecourt hosts the École Nationale de Lutherie, the only public school for luthiers in France. Students from all over the world apply every year to enter the Jean Baptiste Villaume institute to learn the luthier trade, which after the educational reform of secondary education in France has become a two-year university degree.

In England there are a number of schools specializing in different instrumental families: London Guildhall University; Newark College; Chapel Violins School of Violin Making; West Dean College; Cambridge Violin Makers; the Scottish Anniesland College in Glasgow.

Belgium has the Ecole Internationale de Lutherie "Gauthier Louppe - Marche-en-Famenne, and the Ghent School of Violin Making. Finland, with the Ikaalinen Handicraft and Industrial Arts Institute; Norway with the Musikk Instrument Akademiet in Sarpsborg. We conclude our review of European schools with a mention of the Swiss school Geigenbauschule Brienz.

Most of the aforementioned centers are public and receive institutional sponsorship, as is the

case in many Latin American countries. The most important school in Latin America depends on the National Institute of Fine Arts and Literature of Mexico (INBAL) and is located in Querétaro. In Brazil, lutherie courses are part of the conservatory (Curso de Luteria do Conservatório de Tatuí), while in Colombia there are different projects and schools linked to the Directorate of Promotion and Development, and to the Philharmonic Orchestra of Bogota itself.

In Spain we only have two schools, the BELE, a public school of the Basque Government associated with the Conservatorio Superior de Música de Bilbao, and the Escuela de Violería de Zaragoza, a private project, with incipient institutional support of Diputación Provincial de Zaragoza and Ayuntamiento de Zaragoza, promoter of the declaration of Cultural Interest of the Violería in Aragón, approved by the Government of Aragón in 2019. However, in Spain we do not have an official title.

The United States and Canada teach lutherie from university settings. We attach a separate file where you can find the way in which these teachings are taught there, as well as a list of centers.

In Spain, this type of studies are not contemplated in the official plans, hence the importance of the presence of the Escuela de Violería de Zaragoza, which thanks to the Delyramus project has consolidated its training offer.

2.- To maintain a historical artistic and artisan tradition.

During the XV and XVI centuries different families of chordophones were developed in the Iberian Peninsula: hand vihuelas, bow vihuelas, guitars, lutes, harps, cítola, cítara, bandurria... These instruments of Hispanic roots, constitute very important contributions to the western culture, in spite of the great social ignorance on the matter. Many of them, even of uncertain origin, acquire in Spain traits of a characteristic personality, others arise here. They inherit previous trajectories and are "updated" assuming innovations contributed by the violeros. The cultural importance of these instruments in the history of Western music has been sufficiently valued and in the fields of musicology the contributions of Spanish violinists are recognized as transcendental.

The traditional apprenticeship systems remained almost unchanged until the first decades of the 20th century. Guitar makers inherited the postulates and contents of the old fiddlers' ordinances and continued to work according to their principles. The figure of the apprentice, little by little, ceased to exist, as a consequence of the introduction of industrial changes and the search for greater productivity.

With the resurgence of Early Music and the tendency to perform medieval, renaissance and baroque repertoires with historical instruments, some extinct instruments began to be reconstructed. The "new violinists" engaged in this task approached the challenge from intuitive approaches, which led to divergent results. It was necessary to propose criteria that would help craftsmen to solve many of the problems that arise when developing processes, choosing materials and respecting the organological personality of these instruments. The School of Violinmakers of Saragossa arose in this context. The recommendations of Barbieri or Anglés, who strongly advised to attend to the teaching of violinmaking, or what they called "instruments of Art", already at the end of the 19th century, had no institutional response and, at this moment, the Spanish educational system does not contemplate them. The Escuela de Violeros de Zaragoza wanted to fill this gap.

From the end of the 14th century until well into the 16th century, fiddlers developed an unusual

activity of international projection. The quantitative data on the number of active violeros in the fifteenth and sixteenth centuries in some Spanish cities are unparalleled in any other European territory and among them, Zaragoza occupies the preeminent position, therefore it is the ideal place to locate the school.

3.- To guarantee the quality of musical instruments for professional musicians.

Within the approaches of the school, the search for fidelity to the aesthetics of each instrument is of special significance. Sensitizing viol players and performers in this process is especially necessary at a time when, although Early Music already occupies a place in the cultural offer, its adaptation to the great concert stages or to the demands of the market threaten its most intimate essences. The Escuela de Violeros de Zaragoza wants to be a guarantee of quality, based on respect for materials, procedures, structures and ornamentation.

4.- To lay the foundations of a scientific methodology for the recovery of some ancient instruments of Iberian origin..

The results of this objective are described in the following section.

10/5/22



III.- METHODOLOGY

III.1.- The study of violería making from the methodology of cultural history.

The art of fiddling is an ancient manifestation of our cultural and artistic intrahistory, too little known outside the spaces of musicology or organology. Musical instruments have never occupied a worthy space in the classifications of cultural history, even if some specific pieces have sometimes been marginally included as "works of art", especially in treatises on ancient art. Without denying the "artistic" components contained in the instruments, art history has preferred not to invade fields reserved in principle to musicology or organology. This creates a space located at an equidistant point between art history and organology, situated on a difficult frontier. For the first science, instruments do not belong to its field, for the second, they are above all musical tools. Modern organology does not neglect the extra-musical aspects of instruments, but it tends to forget that they are also artistic objects. Art history, for its part, shares this oversight.

In fact, the very name by which we know them leaves no room for doubt. They are "instruments", as tools, devices or utensils created for a specific task, which is obviously "musical". Thus, according to the RAE, a musical instrument is a "set of pieces arranged in such a way as to make musical sounds".

The unique creative space of the violeros has certain characteristics that clearly separate it from other manifestations. In violería a particular lexicon can be observed that gives rise to very specific decorative plans, clearly differentiated from other artistic manifestations, sometimes motivated by its necessary three-dimensionality, mobility or lightness, other times, perhaps because they belong to codes proper to the trade. We are interested in finding out whether we are dealing with a personal language, or a dialectal form, a variety; to what degree does it share an esthetic and a common language with other contemporary artistic creations; was there an interrelation with other arts; were there mutual influences, which could or could not go in the imaginable directions? If the separation between epochs or styles is questionable and the historical period of reference being so broad, in the very particular case we are dealing with, the limits are diluted, are not appreciable and in many aspects nonexistent. Is it possible to project an idea of evolution?

III.2.- Sources used.

We began our study by consulting and organizing in files most of what has been published so far. The interest that the subject has aroused so far has given rise to an abundance of bibliography in the fields of musicology and organology, while other necessary explorations from the perspective of cultural history have been neglected. This unequal treatment is reflected in the particular status questionis of this generality, and while we find well-studied areas, important aspects remain unresearched. Our approach proposes a panoramic vision of the phenomenon, apart from contents more typical of musicology. In order to accommodate the information and studies published to the object of our research, it has been necessary to carry out an extensive work of compilation and classification, grouping the scattered materials by themes.

In addition to the indirect sources and archival information already published, our work has required the review of numerous unpublished documents from archives. This phase has required a great dedication of time, but the results obtained have been well worth it. Thus, we have gathered

information on about thirty violeros, of great interest and of different nature, coming from procedural files, inventories, mercantile or public documentation, letters of petition or concession of inheritances, etc. Some of them are very enlightening about the authorship of the Guadalupe vihuela and others, extremely interesting to know the atmosphere of the workshops, the coexistence among the artisans, their training, social status and mentalities. Among these direct sources, we include another interesting section in which we have been able to extract information on the mobility of vihuela makers between Spain and America.

The original instruments preserved are scarce. We have had the opportunity to study most of them in situ, in the museums and collections where they are preserved. Together with the original instruments, the fundamental source of information, as it is the most abundant in examples, will be the iconographic one. Most of the images we are going to use come from a project in which I worked in collaboration with several Spanish museums. They are high resolution photographs that allow us to observe the details with the greatest precision, something very convenient when using them as a graphic source. In other cases, we have used, whenever possible, photographs authorized by the museums themselves, or images published in different works, of lower quality, but necessary to document or explain various aspects.

Other written sources have been essential to us. The presence of music and its instruments in countless literary, theoretical, theological and public texts, written during the period of study, have allowed us to incorporate the visions of contemporaries about the instruments. Sometimes direct, descriptive or analytical; other times, from different intellectual perspectives, in which the instruments become a symbolic reference tool.

To the information from tangible objects and written sources, we add those extracted from the interpretation of the images in which the instruments of the past are represented. Carreras reflected on Burney's idea that the sonorous and the visual appear integrated in the pictorial and sculptural works that he met on his trip to Venice, where he found numerous musical instruments represented. We are now also interested in the questions that Burney could ask himself about the veracity of the representation, the same questions that have followed one after the other in the minds of the historians of organology up to the present day. Iconography will be an indispensable resource, after a cautious judgment that avoids hasty conclusions. The infinity of represented forms sometimes generates criticism and skepticism regarding the validity of iconography as a reliable source. The arguments are based on an intellectual prejudice that assumes that there could not have been so much variety within the same typologies and that the artists, when representing instruments, were carried away by their own creative imagination. It will be convenient to ponder and consider these theories, to discern representation from creation and thus filter a source that contains tons of information. In a single iconographic example there can be no unquestionable starting points, but from the reiteration of a series that shares similar characteristics, conclusions can be conjectured. Otro factor para la interpretación de las imágenes se establece a partir de los condicionantes iconológicos, de otros condicionantes de la obra de arte, del sentido último de la presencia de instrumentos en las representaciones. La simbología derivada de la elección de determinados instrumentos en las composiciones pictóricas, de algún modo puede llegar a condicionar su representación. En ocasiones serían los pintores los que decidieran sobre los instrumentos a incluir, en otras, los promotores indican el tipo de instrumentos que deberían ser representados, definidos en el propio encargo. Un ejemplo de la segunda posibilidad lo encontramos en el contrato previo a la pintura de un retablo para el

hospital de San Pedro de Carmona, efectuado el dos de junio de 1594¹:

Let all those who see this letter know that I, Juan Bautista Flamenco, painter, a neighbor of the town of Marchena, and at present, in this of Carmona, I am obliged to make, for the Hospital de Sn Pedro, of this town, an altarpiece, with the following conditions:

Firstly, it is a condition that the middle panel must be painted with an image of Our Lady, seated on a chair, dressed in white... and the edges of the mantle and the vestments of the mouths and sleeves must be golden... The image must be accompanied by two angels, one with a lute and the other with a vihuela.

Item is condition that the two boards of the sides, go one St. Peter, and the gold (sic), St. Andrew golden and the edges of the mantle and vestments, golden.

Item is condition, that the wall between the altarpiece and the gardapolvo, must be painted on the whitewash.

Item, it is a condition, that I must be paid for the said work, twenty ducats.

III.3- Chronological and spatial delimitation.

The habit of resembling instruments to artistic styles has given rise to errors. We can read how many speak with excessive naturalness of Romanesque, Gothic or Baroque instruments. There is no doubt about the influences that violinists receive from other arts and from the prevailing aesthetic tastes and idioms, but if the clear separation of styles in the arts as a whole is questionable, in this case it is even more confusing and the evolution of these follows its own trajectories. Cultural development does not occur in parallel in the different territories and the use of different instruments is sometimes a sign of evolutionary irregularities. The passage from one scheme to another, from one instrument to another, is almost never even, coexisting at the same time archaic forms with other recently innovated ones. For example, Mudejar substrates in certain instruments seem to coexist in perfect harmony with Gothic aesthetics, in Renaissance and even Baroque. If the evolution of the characteristics of the instruments was largely motivated by the transformation of musical techniques, at the same time, these were conditioned by the possibilities allowed by the functional and acoustic characteristics of the instruments.

The temporal delimitation that we propose extends from the middle of the 14th century to the middle of the 17th century. It is a long period that could be understood as unmanageable, but we must insist that our work does not respond to criteria of exhaustiveness, although it contains aspirations of systematization. This parenthesis of three hundred years is inserted, as a cycle, as a temporal unit, in a European context characterized by the development of important organological innovations. The activity developed during this period in the Spanish workshops interests us because it gives rise to the beginning of new typologies and brings key innovations in several families of chordophones, conditioning the history of instruments, music and culture, determining its scope will be one of our main objectives. In this period changes take place.

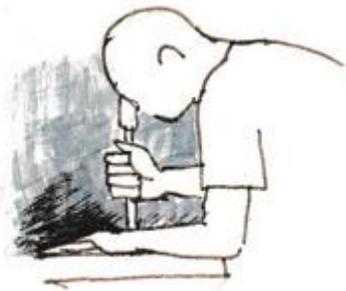
In short, we try to delimit the space in which some cultural constructions were developed, shaped

¹ DE LA VILLA NOGALES, Fernando y MIRA CABALLOS, Esteban: *Documentos inéditos para la Historia del Arte en la provincia de Sevilla, siglos XVI al XVIII*, Sevilla, Artes Gráficas Gandolfo, 1993, p. 142, (APC, Escribanía de Alonso Sánchez de la Cruz, 1594).

over a long period of time, that although they have their origin long before the beginning of the defined period of study, it was not until the middle of the 14th century that they came of age, with the structural, acoustic and ornamental characteristics that interest us. On the other hand, concerned as we are with the artisans in the first place, it is not until very late in the 14th century that we find the first documentary information on their life and professional trajectory. In fact, this information comes to us from a key moment, which we could call transition, in which the trade seems to settle as a professional specialty. At the same time, iconographic representations begin to appear in which fidelity and instruments flood the paintings. Throughout the 15th and 16th centuries, very important creations and innovations took place, especially in instruments belonging to the families of bowed vihuelas, hand vihuelas and harps..

We will also resort to later sources, which will be indirectly useful to understand part of what happened before, but the work closes in the mid-seventeenth century. The changes that take place begin to delimit a new space that we cannot attend to. The instruments we are interested in continue to be built according to the inherited procedures and the guilds seem to maintain their old ordinances, however, changes are initiated that deserve to be studied in a different work than the one we propose. In this new moment of transition, which would last during the central decades and the end of the 17th century, external influences gradually increased, although models, procedures and materials remained in force during the following centuries, reaching this legacy to the present day, as it is present in the DNA of instruments such as the Spanish guitar. These changes do not take place at a specific moment and extend throughout the seventeenth century and even well into the eighteenth century. We have chosen mid-century, not because the cessation from one model to the other takes place then with clarity, but to delimit the second of the chronological parentheses.

The geographical limits within which our study makes sense, coincide with those in which a clearly differentiated activity was developed, due to the social personality of the organizations that brought together their creators and the characteristics of their production in a European context. We have focused our study on the Iberian Peninsula. Some indications guide us on the proximity of the productions of the Spanish workshops of violeros with the Portuguese workshops of violeiros. Necessarily we will have to attend to the projections exerted towards Italy and other territories and to the influences that arrived from other European territories, especially at the end of the period of study.



IV.- CONTENTS-DEVELOPMENT

IV.I.- FEBRUARY 2022 REPORT:

Project management and implementation:

Provide a general description of the status of your project: what are the achievements of the project so far, are the activities being carried out and are the initial project objectives being achieved.

The project started in March 2021 and between that date and the current date (February 2022), the project has been developed according to the premises and objectives defined in the requesting report. We can therefore consider that the project has been meeting the milestones and objectives set.

1.- TRAINING IN TECHNIQUES FOR THE CONSTRUCTION OF STRINGED MUSICAL INSTRUMENTS FOR PROFESSIONAL MUSICIANS

During this first period, which runs from March 2021 to February 2022, we have made progress in two of the three phases planned:

First phase: definition of the methodological proposal and the training program. It includes the definition of objectives, the summary of the methodological experience of the Violinmaking School between the fiscal years 2015 to 2021; methodological proposal for the construction of hand vihuelas, bow vihuelas and Spanish guitar. All these contents have already been concluded and at the end of the project, already in fiscal year 2023, a summary of them will be published on the web or by the means we may have available.

Second phase:

In this second phase, in accordance with the initial proposal, the suitability of the training program for the construction of Renaissance plucked string instruments is being verified. The course started on September 15, 2021 and will conclude on June 15, 2022. In this course we are putting into practice the testing of the methodological proposal with excellent results. Twenty-one students between the ages of 15 and 77 are participating.

Describe in detail the project activities funded through the project management and implementation item that have been carried out so far.

In addition to the drafting of the theoretical contents collected in the previous section, we have concluded the first phases of construction of seven musical instruments (hand vihuelas), including so far the following processes:

- Carved collars in pine, walnut and ebony Wood

- Manufacture of nine hand-pipe covers, for the finished instruments and as a process sample, as prototypes. The tops have already been glued in their two axial mitades and have been calibrated, being pending the work of the bars,
- Cutting of nine bridges and machining of three of them.
- Cutting and carving of seven boxwood loops, in two profiles.
- Making of four floors for hand-held vihuela.
- Preparation of the wood for the lateral frames of four fretboards.
- These works represent approximately 60% of the committed process, so we more than met the milestones required in the initial schedule and objectives.

How is the monitoring of the project being carried out?

The monitoring of the activities developed at the Violeria School is the responsibility of its director, Javier Martinez.

How have the project partners contributed so far? Has the distribution of tasks been readjusted since the application?

The only change that has taken place in the School of Violinmaking is the choice of a complete family of hand vihuelas, in their different versions, instead of the instrumental set of the Monasterio de Piedra of 1390. This change has come about after analyzing the aspirations of the students, who are very interested in 16th century hand vihuelas, in relation to the aforementioned medieval instruments. On the other hand, from a methodological point of view, we have considered it much more ambitious and useful to focus our attention on Renaissance plucked string instruments.

We could mention another positive change, which consisted in the proposal to make an informative documentary, financed within the joint budget destined to diffusion. The documentary, entitled "Arte de Violería en la Zaragoza del Renacimiento" is a tour of those urban places linked in one way or another to the construction of musical instruments during the fifteenth and sixteenth centuries. The School of Violinmaking wrote the script, as well as the production and the voice-over. The documentary was entrusted to Pablo Soriano, a young filmmaker from Zaragoza specialized in cultural documentaries.

If your project involves other organizations that do not formally participate in the project, please describe their involvement:

The participation of the School of Violinmaking in the Delyramus project (Erasmusplus) has been key to progress in obtaining a degree. Although this challenge was not one of the objectives set out in the requesting report, we consider it as an additional achievement of great interest for the consolidation of violinmaking education for adults. The organizations involved in this process are the following:

- - University of Zaragoza, an entity involved in the concession of its own degree in collaboration with the School of Violinmaking. <http://www.unizar.es/>

- Consejo Superior de Investigaciones Científicas, through the group "Recuperación del patrimonio musical histórico" (PAMUS), directed by Luis Antonio González Marín. <https://www.csic.es/es/investigacion/grupos-de-investigacion/recuperacion-del-patrimonio-musical-historico-pamus>
- Instituto de Patrimonio Histórico. <https://iphunizar.com/>, with whom we are going to sign an agreement that has already been drafted and approved, within which the aforementioned title will be framed.

If applicable, describe the difficulties you have encountered in managing the implementation of the project to date and how you and your partners have dealt with them.

One of the biggest difficulties, perhaps, has been to integrate the objectives set out in Erasmusplus with the day to day pedagogical activity of the School. Fortunately, the students have understood the importance of devoting a significant amount of time to defining a methodology. Once the initial difficulties of adaptation had been overcome, the students were very happy to participate in the workshops for reflection on processes and materials.

Secondly, the pandemic we are living through has conditioned the development of some activities, as we have had to adapt to an adequate number of students due to the prudence of keeping distances.

9. Subsequent Activities.

9.1. Impact.

What has been the impact so far on participants, organizations, target groups and other stakeholders?

In this first phase of development of the Delyramus project (Erasmusplus), between March 2021 and February 2022, we have obtained excellent results from the point of view of the social impact obtained. The Delyramus project has become one of the best pillars of the School of Violinmaking itself and thanks to the scientific and pedagogical soundness and solvency that it provides us, it has contributed to the fact that we have obtained this past year 2021 two important awards, the First Prize of the Philharmonic Society of Zaragoza, and the diploma as finalists in the National Crafts Award.

Likewise, our School of Violinmaking has been considered by Interreg Europe, as a good practice of Management, Crafts Code including us in its own website as an example of excellence at the proposal of the CRAFTS CODE program promoted by the municipality of Florence.

V.2.- METHODS OF MUSICAL INSTRUMENT CONSTRUCTION (Second phase of the project, February 2022-March 2023)

CONSTRUCTION AND RULING OF HAND VIHUELAS



Neck of a vihuela of pieces, version of the one of the Guadeloupe vihuela from the Musée Jacquemart-André in Paris.

The neck of the hand vihuelas.

Materials.

Most of the references to the materials used in the making of the necks of the hand vihuelas show a clear preference for pine. In the inventories of Toledo and Madrid, pine from Cuenca usually appears. These were woods that came down the Tajo River to Aranjuez and Toledo. This pine, coming from the Sierra de Cuenca and the Montes Universales, was highly valued for its quality.

The vihuela preserved in the Musée de la Musique, Paris is carved from a single piece of cypress, while that of the Guadalupe vihuela, although it is carved as if it were a single block, was composed of several slats, in a complex work of marquetry that we explain in the auxiliary materials. The guitar from the convent of the Encarnación de Ávila has the neck carved in pine. Several necks that have appeared in underwater sites, coming from shipwrecks, are also made of pine.

Unfortunately, the current violeros do not usually use neither pine, nor cypress nor necks of pieces, the only documented woods. They will know the reasons, perhaps what they build are not vihuelas. We do not understand this lack of rigor that only leads to creations that are not at all historicist. The sum of the whole series of anachronisms gives rise to monstrosities that hurt the sensibility. Respect for the original materials is the first step towards the scientific reconstruction of historical musical instruments, and this principle must be respected to the utmost, even if it generates added difficulties,

requires more time and necessitates long conversations with the vihuelists, even if they are almost always fruitless.

Neck trimming.



Drawing the silhouette of a neck on a pine wood strip with a stencil.



We will start from a wood strip of 8 x 8 x 7 cm, of excellent pine, clean, without knots and with medium density grain. On it we will choose a suitable orientation, trying that the face of the bass, at the height where the knots of the frets will be aligned, coincides with the most dense and rectilinear grain. Once the drawing has been marked with the template, we will mark the transverse silhouette of the head with the help of a mobile angle square.



Pie de foto: Cuello ya recortado con la sierra de cinta.

Neck carving.

In the inventories of the fiddlers we find some tools that they used for the work of the necks. For example, pieces of sword used to appear, which could replace the later neck chisels, which begin to appear later, as in the inventory of Theodosio Dalp's workshop in 1715.

The collar calls for the use of chisels or flat chisels, some wide curved gouges and two-handled collar blades. These are all tools already described in the section on tools. We will follow the diagrams indicated in the drawings. We can see in the different drawings how there is a certain diversity between the thickness of the necks of the vihuelas. Some more archaic instruments dyed very thick necks, almost as much as the same depth of the fretwork at the height of its union with the zoque. Perhaps this is the reason why the hand vihuelas were a little lower at this point, in relation to the butt, looking for a point of proximity to the thickness of the neck..

The Spanish zoque.

The carving always starts from the zoque, which is formed following the shape seen in the photos and on the pla-nos, with the utmost care. The beauty of this type of zoque has been little respected by many, giving it the same lack of attention as the original materials. We must scrupulously respect this morphology if we want our vihuela to be truly historic. Once the block has been carved, we continue along the neck, using the shallow-toothed rasp in the curve. The rasp or rasp is another tool that appears documented in the inventories of viol makers.

The arrowhead.

This traditional ornament that fiddlers carved under the neck, at the point where it joins the head, has been kept for centuries. It is carved with a chisel, preferably wide-cut, very sharp.



Gluing the sheets to make the previous blocks.



Some cuts from the blocks.



Zoque, neck and head already carved.



Top view before being scraped with the blade and without the tuning fork.

Parts handles.

One of the most exciting adventures for a good violinmaker is to work a handle of pieces. We will start with the number of slats indicated in the plans and we will put them next to each other combining light and dark colors. We recommend using very dark woods, such as rosewood, together with other light woods, such as boxwood. Another beautiful combination is Spanish black walnut with

boxwood. Given the difficulties in obtaining boxwood, it can be substituted by pine with very dense grain and sapwood coloration (never heartwood), or very yellow cypress.

We have to assemble some of these blocks, with slats of the measures indicated in the plans and once glued, we will square them to obtain pieces of 8x8 cm and varied lengths. In the materials annexed to the plans this meticulous process is explained with precision.

Head and shovel

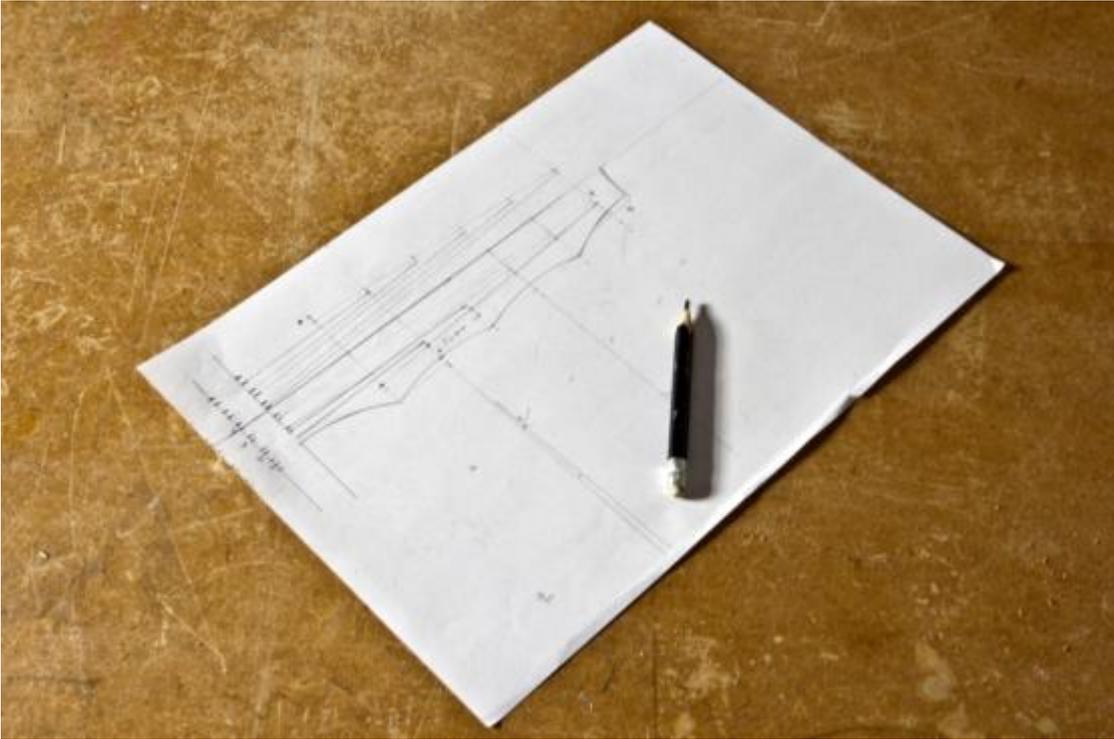
The pegbox of the hand vihuelas was called at the time as "head". There are different types of headstocks, which we can see in the auxiliary materials. Whichever model is chosen, we will draw it beforehand on a piece of paper, or we will copy it directly from the plan. When drawing this scheme, make sure that no string rubs against the pins.

On the head we will glue the headstock, which can be made with only a sheet of wood, 2 mm. thick, or better, two parallel cuts of the same wood, separated by a central fillet, as we propose in this simple hand vihuela. In historical instruments, the head sometimes included a label with the name of the violero, sometimes carved on the side, as in the case of the Guadalupe vihuela, sometimes on the headstock itself, inserting a rectangle of bone in which the name was written, as in the Belchior Dias guitarrilla.

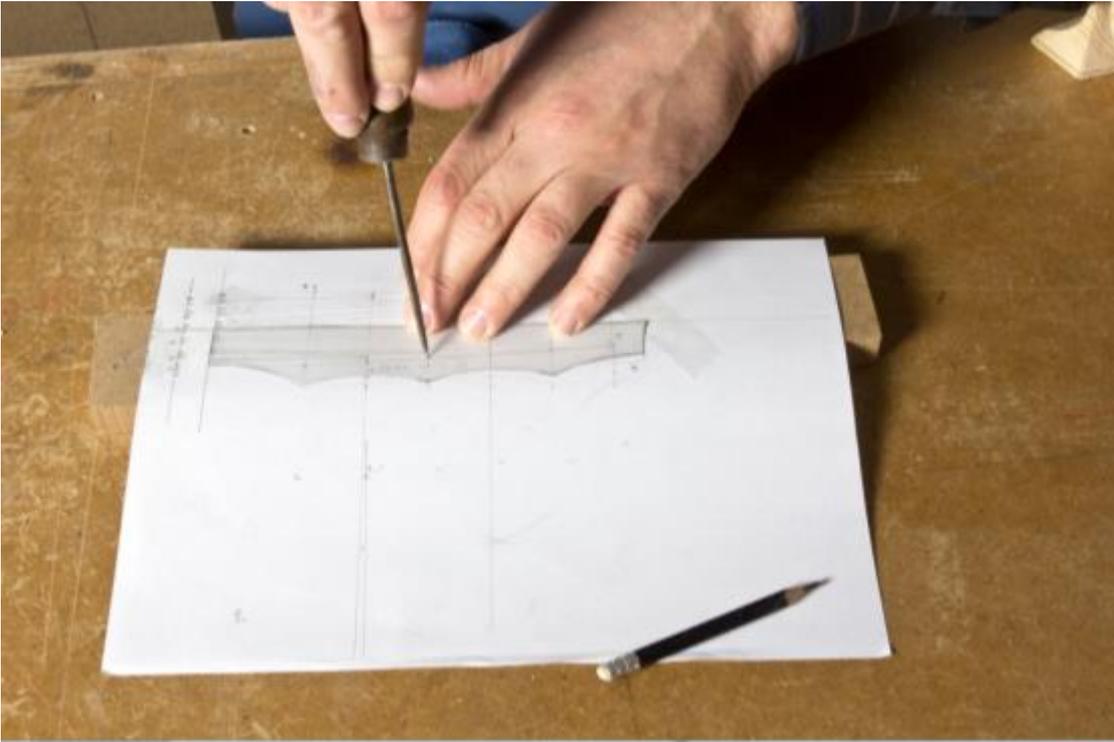
Once the headstock is glued, the holes for the pegs are made in a column drill, making sure that the cuts are completely aligned in parallel. These holes are preferably made with a 5.5 mm. diameter drill bit and then finished with a reamer that has exactly the same taper as the pegs.



Gluing the shovel to the head.



Drawing a head according to the model of Luys de Milán.



Making the template with an awl, in order to transfer the centers of the holes to the head of the headjoint.

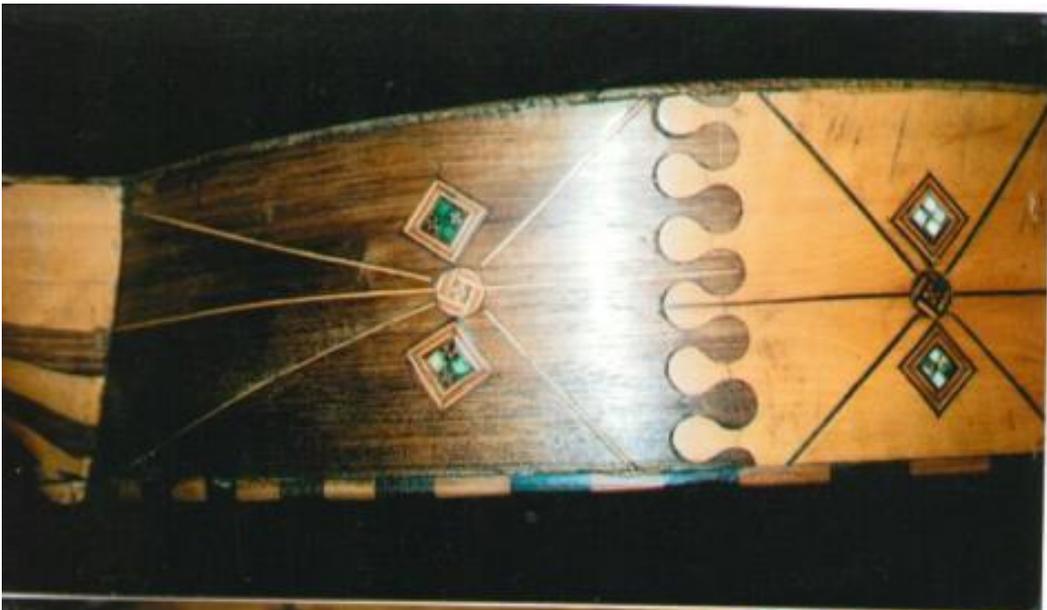


Showing the central fillet that serves as the axis of the symmetrical blades arranged on the sides.



Drawing the silhouette of the head with the template.

Marquetry of the vihuelas of pieces.



Marquetry brings together a set of techniques widely used in the construction of antique instruments. The different procedures used in it allowed the assembly of different woods, which gave rise to panels that share structural and aesthetic functions at the same time.

Marquetry was not always present in all instruments, but we find it with some frequency in bowed and hand vihuelas. There are some clear examples of this presence in iconography. The vihuela painted by Juan de Juanes and preserved in the convent of the Poor Clares of Gandía shows the use of pieces on the neck, as well as the vihuela represented in a panel of the choir of the cathedral of Barcelona and the vihuela of the Coronation of the Virgin, by the Master of San Lázaro, (González-Martí Collection) beginning of the 16th century. The best available source, however, is an original vihuela, the so-called "vihuela Guadalupe". In this instrument, the neck, the fences and the floor are the result of complex marquetry.

Some documents mention the existence of a very specific type of vihuelas, called "vihuelas de piezas". According to some researchers, it is assumed that the vihuelas de piezas were the non-monoxilas, composed of independent trusses, bent by fire, with backs and tops made from different woods, finally glued together. It is possible that this was the case, but at the same time, these documents may allude to a much more specific type. We speak of a certain type built with small pieces of wood, fragmenting the larger units of hoops, back and neck, as happens in the Guadalupe vihuela and we see in the other examples mentioned above. These instruments would be mentioned in this way not to differentiate them from the monoxilas, but from the vihuelas built with whole, unfragmented splints.²

The process begins with the preparation of splints of identical thickness in pieces of different woods. Each light-colored piece is joined to a dark one and this, in turn, to a light one, thus creating an alternating, two-colored rhythm. In this way, the fiddler gave the instrument an aspect of richness that would not be achieved with monochrome cloths and single pieces. Since these vihuelas are more elaborate and ornate than ordinary vihuelas, it is logical to assume a higher cost.



Juan de Juanes (1523-1579), The Trinity with cherubs and angels. Convent of Santa Clara. Gandía (Valencia). Detail, vihuela of piezas. Photo G.J. Angulo..

² Un buen argumento para defender esta suposición lo encontramos en las mesas de piezas, poner aquí. Conocemos la existencia de “mesas de piezas”, en algunos inventarios localizados en Zaragoza en 1516 (GÓMEZ URDÁNEZ, Carmen, *op.cit*, 1987, p.145. Nos resulta una obviedad hablar de mesas de piezas, puesto que todas lo son (si consideráramos esta categorización como la contraria a la de mesas monóxilas). Sin embargo, cobra sentido el hablar de “mesas de piezas”, diferenciables de las habituales, de paños enteros. AL igual, en las vihuelas de piezas, se hablaría de vihuelas construidas no con paneles enteros, sino subdivididos en piezas menores. Esta es una cuestión importante, ya que de ser correcta nuestra hipótesis, las vihuelas de fondo y aros independientes, ya tendría una clara trayectoria. Mencionar las vihuelas de piezas, daría por hecha la diferenciación respecto a aquellas.

In several medieval convex instruments (guitar, lute, lute guitarrench), the back was composed with alternating wood ribs. This aesthetics would be transmitted to the instruments with flat back. The frequent use of bush wood of small diameter, such as boxwood, from which it is impossible to extract boards of sufficient size, added new reasons for the use of pieces. In the 16th century, with the arrival of exotic and very expensive woods, the ancient tradition was given a new impulse, developing very advanced techniques that gave rise to surprising results. The Vihuela Guadalupe is a clear exponent of the high technical level reached by the violin makers in these marquetry works.



This image clearly shows the decomposition of the fingerboard into five triangular pieces.

Vihuela. Oil on panel. Barcelona Cathedral. Photograph by Javier Martínez. This image clearly shows the decomposition of the fingerboard into five triangular pieces.

Capo from the Virgen de la Leche Altarpiece, Valencia Cathedral Museum). In the Guadalupe vihuela the capo has not been preserved but we notice this possible form in the holes where it was placed..

The neck and head of the Guadalupe vihuela.

The neck (neck, according to the terminology of the vihuela makers' guild) and the pegbox (head) were usually carved in one whole piece. In the Guadalupe vihuela, they are carved from a single block, as in the usual vihuelas, but this block was formed by the sandwich technique, created from the union of a large number of pieces. The slats, a little more than 4 mm thick, alternate chromatically, a principle shared with the workmanship of the back (floor). Rosewood (*dalbergia caerensis*) was used for the dark pieces, while all the light, yellow ones are made of boxwood (*buxus sempervirens*). At this point, the marquetry work must be impeccable. Once glued, the blocks are cut at an exact angle. The craftsman cannot make any mistakes, otherwise the linear projection of the pieces and the neck as a whole will be distorted. The two resulting fragments are then glued together again, but turned upside down so that the dark and light pieces coincide at the junction. The gluing, again, requires great precision, to avoid deviations or defective adherences that would put the instrument at risk and would not support the tension of the strings. From successive cuts and crosses, the desired visual results are obtained.

The marquetry of the neck derives from an aesthetic quest and is intended to demonstrate the mastery of the violinmaker. The aesthetic plan is so meticulous that we cannot understand it as exceptional or unique, applied to this single instrument. The geometrical variables and the enormous technical difficulty of the construction of this vihuela lead us to think that we are before one more example of a well rehearsed tradition.

The way of working the pegbox and the headstock, in its union with the soundboard, has already been studied in the section on architecture. It is identical to the one that would have had to be made from a monoxile block, as on ordinary vihuelas. The head, composed of several attached slats, like the rest of the neck, is laterally embraced by two thicker woods, carved following the silhouette that we will describe in the corresponding section. On the boxwood side, the sign "Guadalupe" appears, drawn with letters on fire and a little heart inlaid with silver, like a tiny inlay.



The compositions of the background, survival of the ornamental lexicon of Islamic roots.

The background is formed by two symmetrical panels. Each of the two compositions includes a focal circle, subdivided into a twelve-piece cross. Starting from each of these two focal points, on each side, ninety-eight triangles with vertices tangent to the central circle are projected occupying the entire space of the panel, arranged in two-color alternation.

The geometric compositions in the background may be meaningless, but they seem to represent two cosmic symbols arranged symmetrically on either side of the central axis. If so, they would evoke two celestial bodies in motion. The central circles appear to be rotating stars and the multitude of radii, their projections of light. The representation of rotating celestial bodies belongs to a long tradition whose roots go back to classical antiquity. The tradition of rotating domes in architecture comes from cosmogony before Galileo. Oleg Grabar, in studying the rotating dome

of the Hall of the Two Sisters in the Alhambra, traces the origins of this tradition to³.

The aforementioned aesthetic motif is also present in Mudejar art, although we do not know if it was used without its original meaning and survives only as an inheritance of previous artistic traditions, with a merely ornamental sense. The so-called Mudejar star, reproduced in a multitude of tiles, maintains the same rotating and centrifugal sense and links perfectly with the symmetrical compositions of the Vihuela Guadalupe.⁴

³ GRABAR, Oleg Grabar, *La Alhambra: Iconografía, formas y valores*. Versión castellana de José Luis López Muñoz. Madrid, Alianza Editorial, 1981. Resume distintas teorías que coinciden en este enfoque: R.W. Hamilton, "The Sculpture of Living Forum"; Ettinghausen, *From Byzantium to Sassanian Iran, passim*; G. Le Strengé, *Bagdad during the Caliphate* y Bargebuhr, *Alhambra*. En primer lugar conocemos algunos antecedentes literarios, como el poema de Ibn Gabirol, poeta judío del siglo XI, describiendo una cúpula giratoria y asociándola a Salomón. La propia Domus Aúrea de Nerón, en Roma contaba con una cúpula cósmica giratoria. Esta tradición antigua es asumida por el islam, que la incorpora a su estética y la convierte en un reiterado motivo ya desde el siglo VIII. En al-Ándalus se renueva esta tradición y además de en la Alhambra aparece en Medina Azahara, en el siglo X, donde se creaban efectos de rotación mediante la luz.

⁴ Usón Villalba, Carlos y Ramírez Martínez, Angel, "La geometría, un camino hacia la belleza", en *Revista Trébede*, núm.: 62, pp. 72-76. Zaragoza, abril 2002. En este artículo se analiza el Carácter giratorio de la estrella mudéjar.

This instrument has been restored several times, most recently by Abondance . The back, back or floor of the instrument has been precisely one of the parts on which most of the work has been done. As a consequence, there are some new pieces incorporated and brush adjustments on the old ones. This alters the dimensions of the rays, but finally, in spite of these unfortunate alterations, the composition offers no doubt as to the process by which it was designed. The angle of the rays is of different openings, not being equal, but giving the final sensation that they are, since the opening of the rays at their intersection with the perimeter of the case is similar. To achieve this, the angle of the shorter beams is just twice that of the longer beams. Between them, a perfect gradation is calculated, the angle being inversely proportional to the length of each radius.

Another aesthetic principle with Islamic roots is the linear projection to infinity. This constant pervades in the loop compositions, where a central star organizes a series of radial ribs that start from it, giving rise to new forms that are repeated, decorating the entire surface. In our case, the central star and the radii are maintained, but, in contrast, we observe how there is an axial axis that organizes the two lateral compositions. This novelty responds to the imitation of the background built from two whole slabs, joined by a central axis. In a composition of pieces, such as this one, this axis could very well have been dispensed with and the design reduced to a single composition; however, the criteria of traditional *violería* have prevailed.

We also notice a certain *horror vacui*. The entire back of the *vihuela*, and even the entire back view of the instrument, including the floor, neck and head (4) form a totally decorated ensemble, due to the radial bicolor pieces of the floor or parallel pieces of the neck, giving the appearance of a totally decorated body, in accordance with the aesthetic principle of *horror vacui*, another Andalusian constant inherited by the *Mudejar*.

Hoops and fingerboard: Pieces set with complex tongue-and-groove joints.

The pieces of the hoops recall the centrifugal ornamental structure of the great compositions of the background. Six spokes, formed by inlaid fillets, start from an openwork circle with an inlay. The central circles consist of a composition formed by a central nine-foot checkerboard, flanked on its four sides by alternating strips of light and dark wood, again creating a sense of rotation.

Ceramic kufic calligraphy of Imam Ali in Najef, Iraq. The name Allah appears eight times, four in color and four in white. Each black-white pair is repeated four times by successive 90° rotations. This inscription responds to two aesthetic principles shared with the decoration of the hoops of the *Guadalupe vihuela*, rotation and positive-negative alternation.

The upper and lower angles in the central space are again inlaid with simple four-piece diamond checkerboards, framed. The union of the pieces of the hoops is established by means of a two-color tongue-and-groove joint again in a serpentine line that gives rise to semicircular entrances and protrusions. We find new manifestations of these motifs in a *Mudejar* ceramic albarello made in workshops in Teruel in the last third of the 15th century and preserved in the Museum of Ceramics in Barcelona. In this piece there is a drawing identical to these crimps, especially those of the union of the hoops at the base of the resonator. To break the rhythmic sequence of the side pieces, the hoops end in segments longer than the rest, perforated this time by two circles instead of a single circle. This

solution, in addition to being aesthetically impeccable, makes it possible to adjust the hoops more comfortably since it makes it possible to regulate their length once bent. For the same reason, the truss connection is not direct between the two end pieces, but two straight threads separate the crimp from the rest of the piece.

Along the hoops there are some inlays randomly distributed at various points of the hoops. They are small green or dark wood circles. It could be a system to join the pieces of the hoops to the inner reinforcement structure, or to the mold. In any case, the artist takes advantage of this new opportunity to incorporate these elements to the ornamentation.

In the vihuela of "The Trinity with cherubs and angels", from the Convent of Santa Clara de Gandía, painted by Juan de Juanes (1523-1579), we observe how the pieces of the hoops, in this case triangular, forming eight blades, are repeated on the fingerboard. The fact that the compositions of the hoops and the fingerboard are similar in these two cases seems to indicate that we are possibly facing a common aesthetic norm, in which the compositions of "the floor and the neck" are frequently repeated.

*Curvado de los aros de las
vihuelas de mano*





Aros de una vihuela de piezas siguiendo el modelo de la vihuela Guadalupe, detalle.

Bending of the hoops of the hand vihuelas.

Since the procedure is identical to that of the guitars, with the only exception that the vihuelas use specific woods (walnut, ebony, cocobolo, ginjaolero), we do not duplicate the counting again, but use the same one as in the guitar's homonym.

We will, however, make reference to the peculiar way of assembling the set hoops of the vihuelas de piezas.

Marquetry of the lateral frames of the vihuelas of pieces, following the model of the Guadalupe vihuela.

The sides of the Guadalupe vihuela alternate pieces of rosewood or Spanish black walnut and boxwood. The union of the pieces is formed by a complex marquetry. Each of the pieces is joined to the other by means of "tongues", forming a sinuous tongue-and-groove joint that lengthens the line of union, reinforcing it and allowing it to be bent by fire.

This system is very complicated and beginners can not get into it until they have mastered the techniques of the whole trusses.





Vista del braguero de piezas de una vihuela. Modelo Guadalupe.



Versión sin taracear del sistema de cercos de piezas.



Recortando las piezas de los aros con la sierra de marquetería.



Comprobando la coincidencia de las dos piezas.



Comprobando la coincidencia de las dos piezas.



Comprobando la coincidencia de las dos piezas.

*Unión de los cercos y el cuello
en las vihuelas de mano*





Spreading the tail on the seine before inserting it into the groove of the zoque.

Union of the fences and the neck in the vihuelas de mano.

Trimming of the hoops and inlaying in the block.

Once the vihuela's rims have been bent, we will adjust their longitudinal measurement to the needs of the template in question. First, we will reposition the rim on the mold, looking for the best match. Then we immobilize it, taking as a reference the horizontal plane of the mould. Once the frame is positioned in this way, making sure that it rests well on this plenum and that it maintains an angle of 90° in relation to the mold, all the way around. Then we immobilize it with the clamps. In this process we need a board that serves as a support, with the same silhouette as the mold itself on the outside and with an extension that reflects the projection of the neck.

The longitudinal axis is traced on the support-board with a pencil. This line is basic for the instrument to be perfectly aligned later on. Then we mark on the neck of the instrument its own axis of symmetry, both in its upper plane where later the soundboard will be glued, as well as in its lower part, around the headstock and in the head or pegbox itself.

We mark the exact angle on the frame by transferring it from the one we made in the lateral cut of the zoque and we cut it. We immobilize the neck with the help of a tool that we have previously built and that consists of a board of the same width as the neck, to which we adhere two other verticals that will have the same height as the vihuela, taking into account that the height maintains an angular deviation, as can be seen in the plan. This procedure allows us to immobilize the vihuela reproducing the spatial configuration we want to give it.



Marking on the bass ring with the square, the vertical coinciding with the axis.



Marcando la vertical coincidente con el eje a la altura de la culata.



Comprobación de la curvatura del zoque.



Cortando el aro con el ángulo exacto para que entre bien ajustado a la ranura del zoque.

We will make the vertical axis of the block coincide with the longitudinal axis marked on the sole-board and fix it in this position. It is interesting to slash the fragment of the frame closest to the junction with the neck, since once glued it will be more difficult to smooth.

Once the rim is perfectly cut and the neck is immobilized, we introduce the rim in the groove of the block and glue it. The wedges enter from both sides and in the sill we will open an opening through which we will control the pressure of the lower wedge, while the work of the upper wedge will be more visible. Once the wedges are well tightened, we will clean the glue, disassembling the neck and the ring of the mold, the sill and the neck clamping tool. We will, of course, use hot bone glue. It is easy to clean it afterwards with a damp cloth before it sets.

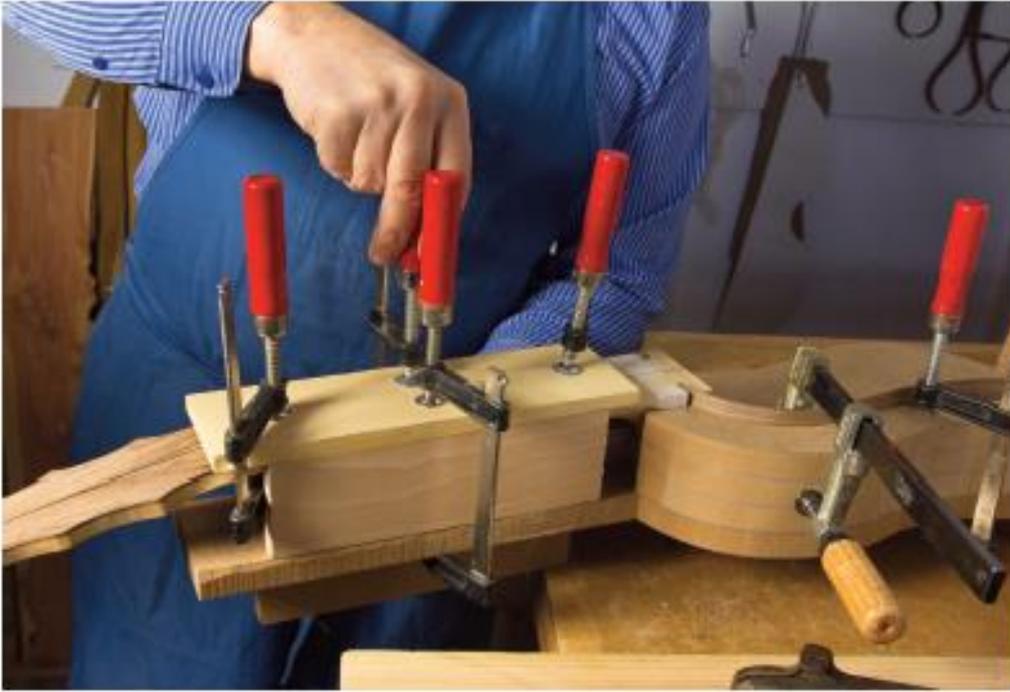
Once the glue is dry, we will repeat the same sequence with the side frame of the bass.



Lijando los cerros antes de la unión con el cuello.



Marcando los ejes en el zoque y presentando el cerco.

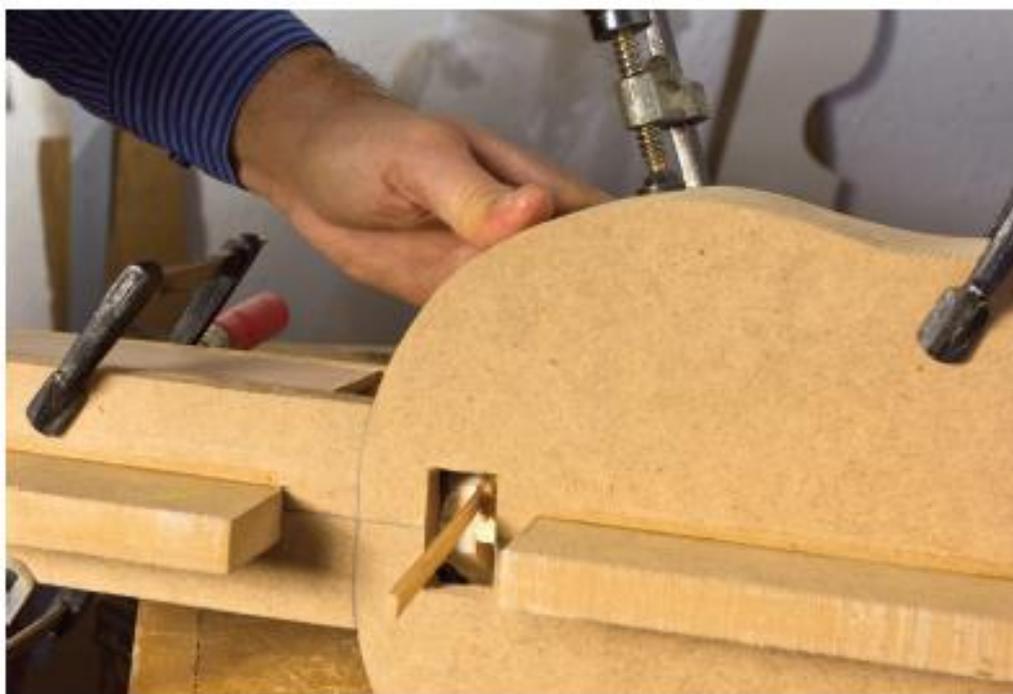


Inmovilizando el mástil con ayuda del soporte adaptado a la anchura del cuello y a la altura de la vihuela.





Introduciendo la cuña superior.



Introduciendo la cuña inferior por el vano de la solera.



Obsérvese la cinta de carroceros adherida al cerco, para evitar que la cola manche en exceso el cerco
Limpieza de la cola.



Recortando la cuña inferior.



Recortando la cuña superior.

Brushing the edges before gluing.

Before gluing the tops or bottoms, the edge must be brushed to align it perfectly. This operation is carried out with a very sharp-edged blade.

A longitudinal line is marked on the board parallel to the wood fibers, which will guide the brushing. A 3 cm thick piece of wood is placed on the bench with sides of approximately 25 cm. X 60 cm, preferably of MDF. One of the two pieces to be glued is placed on this support-board and fixed to the bench with the help of a clamp. The cover should overlap the MDF board by a few millimeters. Next, the entire length of the board is glued, taking special care to make sure that the gluing bead runs along the entire length of the board. The grapple will rest directly on the bench, if its surface is smooth and taking care that the angle of the blade with respect to the top is 90°. When the edge is considered to be perfectly straight, its linearity is checked with a ruler.

Once the two halves have been planed, they are joined together and placed against the glass of a well-lit window to check that the joint is perfect and does not allow light to pass through. It is difficult that at the first sight the wood joins well. Then, we will mark with a pencil the points of union, to brush them, to avoid any curve.

This operation is extremely important, since a poorly glued cover will always leave a very visible center line, which spoils the final appearance of the cover and does not allow optimal adhesion.

Possible systems for gluing the boards.

It is easy to find in the books published on the subject, or on the Internet, different possible systems to glue the tops and the bottoms or floors. We will describe the two most common ones and a third one, recommended by us.

1.- Gluing by using a press built specifically for this purpose.

Some guitar makers used presses consisting of three base strips, on which horizontal clamps were placed, generally three. The press was completed with an upper horizontal bar, perforated with three holes that housed other clamps, in this case for vertical clamping.

This tool can also be used in the gluing of the tops of the bow vihuelas and also has other uses, such as the gluing of bars on the back.

2.- Traditional system of wedges and strings.

It requires the construction of a press formed by three horizontal strips, glued together, forming a perfectly flat base, as can be seen in the photographs.

In this case, we will use as an example a floor with its corresponding central fillet. The two halves and the central fillet are smeared with glue and placed on this kind of grill, having previously put on it a paper or adhesive tape along its axis, to prevent the wood from sticking to this base. A strip of paper or masking tape is stuck on them.

3.- Gluing of boards with the help of two DM boards and clamps.

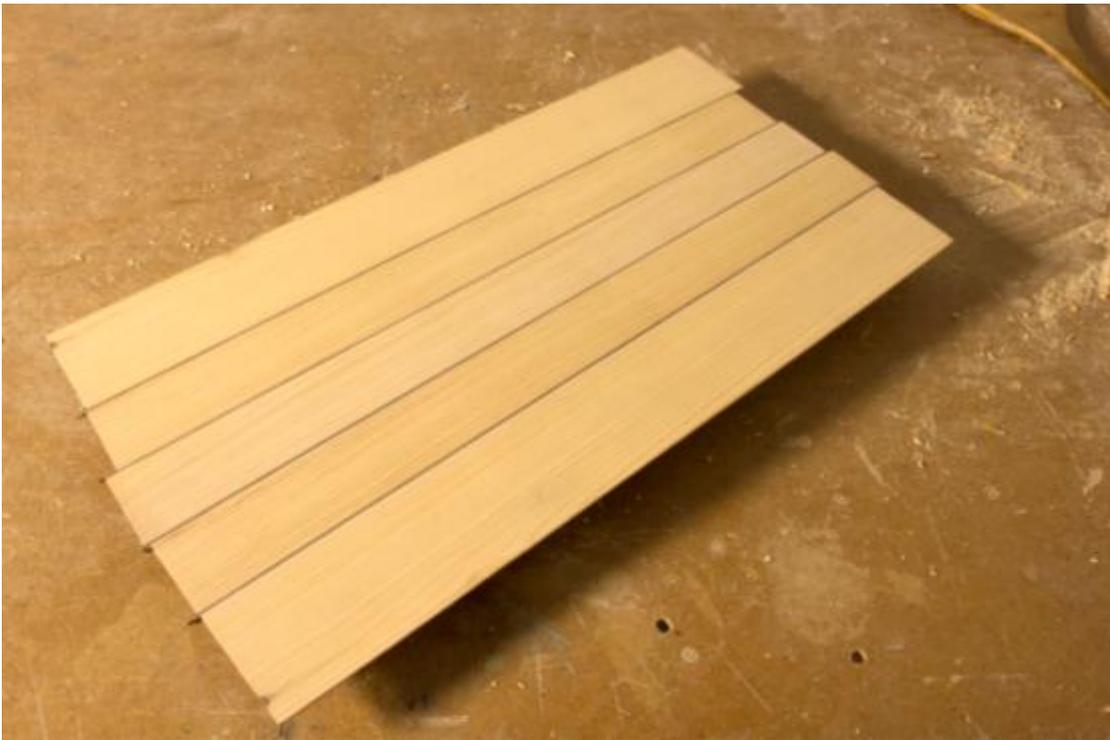
I usually use the previous system, or preferably the one I will describe below, because it exerts much more pressure on the wood, significantly improving the joining of the pieces. Another advantage of this procedure is the lack of necessary equipment, since it only requires four good clamps of 60 cm opening and two MDF boards of different sizes, depending on the size of the instrument.

On one of the two boards, a masking tape is stretched to prevent the boards from sticking to it at the end of the operation. The boards are glued together with hot glue, the boards are assembled and masking tape is placed over the joint. On this union, we put some dowels that are clamped vertically, in the case of the tops and in the case of the bottoms, a new board like the lower one.

We tighten the two boards with two lateral clamps, which will force the two halves to be perfectly levelled.

Gluing of rib-formed bottoms.

The ribs to form the floors were a frequent solution in bowed and hand-held fretboards. Pieces from the same cut are chosen and arranged in such a way that the grain forms a harmonious whole and are cut according to the measurements of the different planes. Then, strips of ebony or European black walnut wood are cut 1 or 1.5 mm thick and 3 mm wide, for the length we need in each case. In the photo below we see one of these backdrops, in this case formed by cypress ribs and black walnut fillets.



The ribs are joined on a board that will be cut to a size equivalent to two ribs already connected, with the fillet inserted. The ribs and the fillet are placed on the board, as if they were already glued, and the outline is drawn on the board, leaving a margin of two millimeters less. Over it, we fix masking tape and distribute glue on the board edges that we need to attach and over the fillet.

Once we have glued two of these ribs, we glue another one, following the same procedure. Depending on the number of ribs, we will modify the dimensions of the base board. Once the joints are dry, with the scraping blade we remove the excess of the fillets that protrude from the plane of the bottom and we go over the whole bottom with sandpaper, wrapped in a wooden block. The sandpaper dirties the wood penetrating through its pores and although this does not represent an aesthetic problem, since we will varnish it and the dirt will not be appreciated, it represents an inconvenience for the vibration. The best way to remove this encrusted dust is to use a glass that is obtained from the breakage of a bottle, with the edge completely aligned in a homogeneous curve, without teeth.

Harmonic bars at the back.

Since no original 15th century bowed vihuela has been preserved, we cannot know conclusively the way in which the interior reinforcements were resolved, however we have many certainties regarding the closeness between these instruments and the bowed vihuelas. Our hypothesis is that the bowed vihuelas had an interior architecture very close to the hand vihuelas.

The bars are cut from a block of spruce or from the remains of the wood used in the tops, in sections of 6 x 25 mm. The length will be the same as shown on the plans. Once their edges have been aligned with the brush, they are glued on the bottom, preferably with the help of wooden clamps, as shown in the picture above.

Once the bars are fixed on the background, before the glue dries, they are cleaned with the help of a damp cloth and a wooden stick that helps us to reach the most recondite parts.

When 24 hours have passed since the gluing of the bars, we will be able to refine them with the brush, reducing its thickness in its upper part. Next, we will brush the upper edge, without finishing it with sandpaper, to avoid it getting dirty with dust. It does not matter too much that some imperfections remain on the surface of the bars, which is why they are usually sanded on other types of instruments. In this case it is preferable that they are just brushed.

The "truss" of the vihuelas.

As we explained in the section dedicated to the union of the trusses and the neck, the lower end of the hoops, or trusses, is cut in the vertical line coinciding with the longitudinal axis of the instrument. From this line, the classic "v" of the truss rod of the vihuelas will be marked.

First of all, we will immobilise the instrument by placing it on a very firm bar, immobilised with clamps. This bar flies a few centimetres from the woodwork bench, and in this space, we will fix the mould of our vihuela.

We find this solution in several historical instruments since the 16th century and it is maintained in different later instruments as we will see.

In the succession of images, organised sequentially, the whole process can be followed in detail.



Cutting the truss angle.



Drawing the "V" of the wedge



Gluing the fences to the stock socket.



Adjusting the "V" to the angle of the trusses.



Trimming off the longitudinal excess of the wedge.



Assembling the vihuelas.

Gluing the floor.

First of all, we will go over the fences around their perimeter with the large blade chisel. The crown of the frames, already attached to the neck and closed at the bottom by the stock, is immobilized by the mold. We will check its perfect symmetry and check the linearity of its cuts, carefully going over with the brush so that it is perfectly level. To check this, we will place transverse slats on the rings at different distances, verifying that they are perfectly aligned in relation to the mast.

Next, we immobilize the vihuela again with the same tool that we used when fitting the frames into the zoque and place it again on the floor. Place the floor between the screed and the fences, after applying the glue, tightening the joint with the tightening screws.

Linen inner reinforcements.

The union of the hoops and the floor, in the hand vihuelas, in the bowed vihuelas, harps, guitars and other instruments, were reinforced with linen glued to the apex. The viol makers' ordinances required the instruments to carry these reinforcements, as a guarantee of quality and durability. We will maintain this traditional procedure, which has a great importance in the architecture and sonority of the instrument. There are those who have abandoned it and use counterhoops, which is absolutely unscientific, since wooden backhoops are developed much later.

The old linen, which is no longer on the market, is of excellent quality, it is much thicker than what we currently find in fabric stores. It's hard to find, but it's still possible. Some of the grandmothers' old sheets are made of this magnificent linen.



Checking that the perimeter of the floor fits within the line of holes in which we will insert the screws.



Trimming the hoops at their junction with the zoque.

The pawns of the bars.

Pawns are pine rods that are carved from 8 x 8 x 50 mm slats. They are carved with the chisel and with the razor.

It is another of the characteristic solutions of Spanish violeria compared to European violation. Bar pawns have a triple function. On the one hand, they guarantee that the lid fits perfectly on the rings without deviations, on the other hand, they reinforce the joint, which in the case of the lid is very

subtle, as it lacks counter-rings and linen reinforcements at its junction with the frames. Finally, they perform an important acoustic function, such as vertical ribs for the transmission of vibrations.

Gluing the lid.

The lid is glued last. This statement is not trivial. The process of assembling the vihuelas and the Spanish Baroque guitars is clear and the original instruments preserved prove it. If the lid were glued to the collar and hoops before the floor, it would be the one that would receive the linen reinforcements and it is not the case. On the original instruments we can see perfectly how the tail descends from the lid, which again proves this evidence. We insist on the need to assemble the vihuelas in this way and not as is done in many current workshops, imitating the contemporary procedure of assembling the guitar. Beyond representing a romantic reminder of the ancient procedures, maintaining this consistency is essential to preserve the acoustic personality of the hand and bow vihuelas.

The bars must be trimmed so that they fit very tightly inside the frames. Once these two marking and trimming operations have been carried out, the lid is ready to be glued onto the crown, with the help of screws.

*Puente, cejilla, trastes y
reglaje de la vihuela de mano*





Bridge, capo, frets and adjustment of the hand vihuela.

The bridge.

In the plans of the different instruments, we include concise specifications on the most appropriate measurements of the bridges. We propose a system based on the Chambure vihuela bridge. In it, each order has an opening, open from the base of the bridge, with a rectangular section. This solution has the advantage that it allows the strings to be moved out of order within a small margin, but, at the same time, the disadvantage is that it reduces the gluing surface of the bridge with the risk of it coming off. To avoid this problem as much as possible, the spans in which we open the bridge are triangular, placing one of the vertices at the base and expanding the width of the horizontal side a little with respect to the measurements of the Chambure bridge. In this way, we expand the range of mobility of the strings of the same order, while at the same time we expand the gluing surface. Una madera excelente para construir puentes, es el nogal. Se trata de una madera de grano fino y fácil de tallar, suficiente resistencia y poro abierto, que permite su perfecta adhesión a la tapa del instrumento.

I recommend varnishing the cover before gluing the bridge. This way it will be easier to clean the glue remains and we will not dirty the area around the bridge during varnishing. To do this, we will stick a strip of masking tape, or better yet, good quality plastic adhesive tape, in the exact place where the bridge will be attached. The tape will be somewhat narrower and shorter than the bridge and at the ends it will reproduce the silhouette of the tips, a few tenths smaller all around. Once varnished, we will remove the tape and clean the area perfectly so that the bridge adheres perfectly. To glue the bridge, we will use an easy-to-make auxiliary tool. It involves cutting out the exact silhouette of the bridge on a board, on its upper face. In this space, the bridge should fit perfectly. At the bottom, we will place a flat strip, the same thickness as the top slat. Both slats will be perfectly centered on the exact point where we have to locate the bridge using clamps, placing another transverse slat under the sound board so as not to hurt it at the base with the clamps. When we have tested several times and we have no doubts regarding the location, angle with respect to the axis and firmness of the holds,

To avoid unnecessarily dirtying the bridge, we will surround it with a strip of carpenter's tape, gluing it well without it ever reaching the base. Likewise, we will stick masking tape on the cover, all around the bridge, so that it does not get glue stains. Once these two operations are done, we will glue the bridge. The upper plane of the bridge has a slight inclination. On it we will place a tablet that reproduces its angle in negative, so that when placed on it, the upper plane is perfectly horizontal. In this way, on the one hand, we will prevent the bridge from being damaged by the clamps, and on the other, we will distribute their force evenly for perfect adhesion. Once the clamps are fixed, we will remove the two slats from the base and carefully clean the remains of glue.

Following Bermudo's instructions, the bridge should be slightly inclined with respect to the longitudinal axis of the instrument at the height of the bass, in this way, the differences in tuning of the bass strings are neutralized. In gut strings, this inclination is much more necessary, due to the knots in the staves, which shorten their pull.

Capo.

The measurements of the width of the nut are almost always a source of doubt when building a vihuela. The preserved historical vihuelas curiously maintain the same measurement, 45 mm, from tip to tip of the nut. For some musicians, it seems too narrow and they prefer wider measurements, even up to 55 mm. However, great vihuelists, such as Eugène Ferré, for example, defend the historical measures at all costs. We are in favour of respecting these measures, but we warn beginners that if the musician to whom their vihuelas are aimed comes from the world of the guitar, he will prefer wider widths, something that for the great masters, distorts the personality of this instrument.

We usually use mammoth ivory to make the nuts. It's a difficult material to get and expensive, but it's worth it, as it's not as rough and hard as bone. In its absence, we will use bone. The bone can be purchased ready-made, or it can be made in the workshop itself. I prefer to make my own nuts, from a chosen piece of beef bone. The work is a bit cumbersome, but it's worth it. Once cut into cells slightly larger than the dimensions of the nut, we will immerse it in hydrogen peroxide of 110 vols., for a couple of days. In this way, the bone is free of impurities and expels all the fat, so that when the nut is finished, it will have a precious luster.



Cejuela de marfil de mamut.

Frets.

The frets, in the hand vihuelas that are currently being built, are simple. That is, they only circle the neck of the instrument once. It would be impossible to sell a hand vihuela with double frets. This fact

deserves more than one reflection, since there is very clear evidence of the presence of double frets on the neck of the guitar of the convent of the incarnation of Ávila and in iconographic representations, such as the vihuela or guitar represented on the top of an organ preserved in the cathedral of Barcelona. It is one more example of the scant interest of most musicians in the use of historical solutions and it is unfortunate to see how many times they prefer to accommodate historical reality to the theory we have about it. Without delving too deeply into this question, which deserves further investigation, the auxiliary materials describe in detail the procedure for tinkering with vihuelas.

The caliber of the frets is another issue that must be reconciled with the musician. In general, calibers that are not very thin, from 0.80 to 1 mm, are preferred, but these measurements must sometimes be modified in the setting to avoid lisping.



Cuello de la guitarra del convento de la Encarnación de Ávila, en la que se aprecian las heridas de los trastes dobles claramente.

Adjustment.

The adjustment of the hand vihuelas is one of the key elements. The personality of these instruments makes set-up operations much more difficult, for example, than on the guitar. The strings cannot be adjusted in height with the same margin as the guitars, as they lack a bridge nut that allows the height to be adjusted. On the other hand, in the previous construction operations, it is difficult to achieve the exact angle between the neck and the top if we follow the historical sequence, that is, if we glue the lid on the rest of the instrument and not at the beginning, on the neck, before inserting the frames. On the internet we can see how most of today's viola players follow this second procedure, thus ensuring a perfect alignment, but irremediably distorting the personality of the instrument. It is always preferable to maintain the historical sequence, even if the set-up is a little complicated.

The plans show the exact measurements that we must achieve, the distances of the strings on the fingerboard, at the height of the bridge and the nut. They are ideal measures, but sometimes it is difficult to respect them. Each instrument will always present some variations, which will be resolved by completing the adjustment in a particular way, with the use of the scraping blade on the fretboard, or by changing the gauge of the frets.

The height of the strings can be adjusted slightly on the bridge, by raising or lowering the knot. It will be enough margin to prevent them from rubbing against the frets. The fingerboard, preferably constructed of ebony wood, can be completely straight on its surface, or with a certain longitudinal concavity, if this second solution increases the angle of the chord with respect to the fretboard in the lower half of the neck, closest to the nut.



Vihuela totalmente encordada en tripa.



Vihuela encordada en tripa y bordones entorchados.

CONSTRUCCIÓN
Y REGLAJE DE
VIHUELAS DE ARCO

*La tapa de las vihuelas de
arco*



The cover of the bow vihuelas.

Carving the outer surface of the soundboard of the bow vihuelas.

The bow vihuelas had a large number of variants. Those with a glued bridge had a flat top with sufficient thickness to balance the tension of the strings, just as was the case with hand vihuelas, lutes or guitars. But in this case we are building a vihuela with a domed top, a solution designed to increase the resistance against the pressure of the bridge. The cap is formed from a radial cut from a good quality spruce or Scots pine trunk. In the latter case, sapwood should always be used. In this case, we have chosen a cut of Scots pine from the Montes Universales, very suitable for these small bow vihuelas, an excellent wood for soulless instruments, as is the case.

The board, once glued, is cut out with the instrument template, leaving a few more millimeters of margin around it. With the help of a gramil, which we can build with a board and a screw screwed into it, at the desired depth, we will mark a line parallel to the lower plane 5 mm deep, which will help us control the thickness that we will give to the cover in all its contour. We begin the carving with a very sharp gouge, marking transversely a series of large grooves, which follow the silhouette of the vault, according to the transverse lines and the longitudinal axis that appear on the plan. Next, we remove the spines of these grooves with concave brushes and scraper blades.

It is very interesting to check the thickness of the board against the light. Before concluding it, we will verify its resistance to torsion with our hands and, at the same time, we will tap a few taps to evaluate the response to vibrations and the time during which they are prolonged.







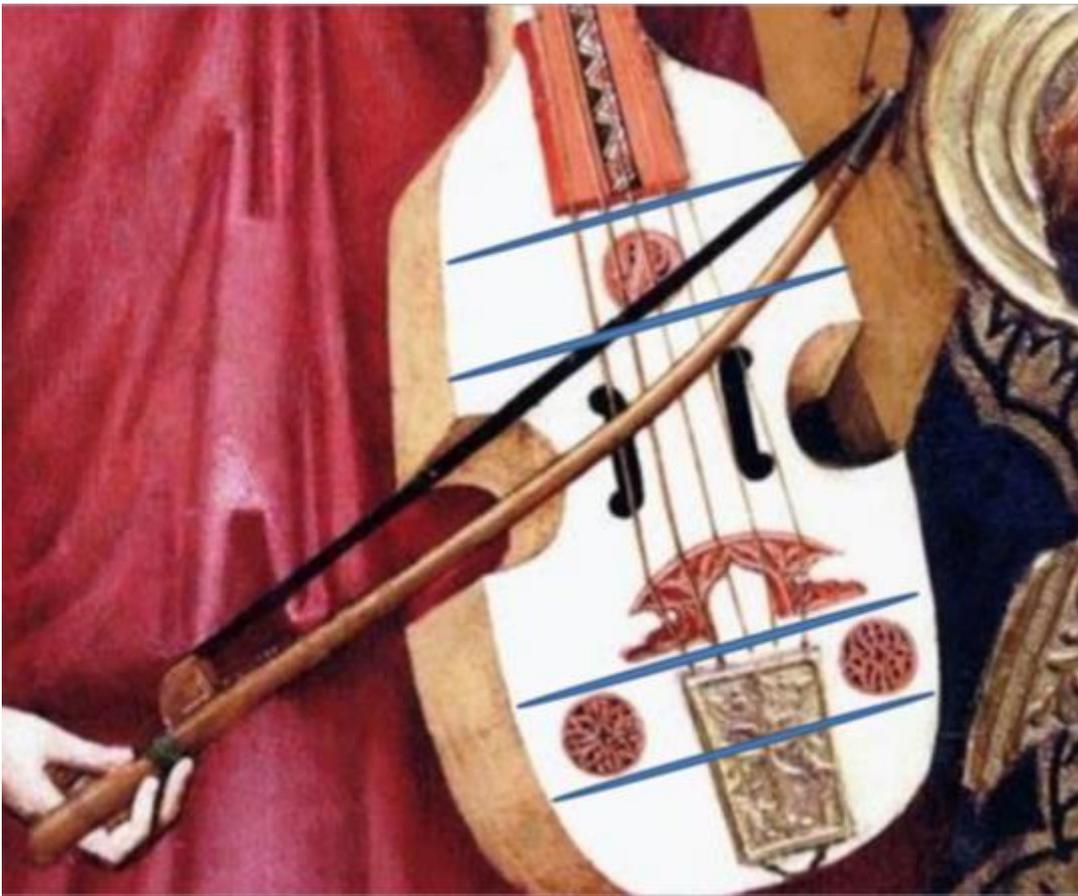
Opening of the “Ces” or ears.

We will make a template in transparent plastic or greaseproof paper to transfer the drawing of the “Cs” to the lid. Next, with a very sharp cutting gouge or a scalpel, we will cut out the inside of the ears, being very careful to always carry the cut in an angular direction over the grain, never facing it, because it would dig into the wood. . The opening of the ears must be finished with patience, so that the cut is perfectly clean.

Harmonic bar.

As no original instruments have been preserved, we have no clear evidence regarding the presence or not of internal reinforcements attached under the soundboard.

Another great mystery of the early bowed vihuelas were the inner reinforcements of the soundboard. In some cases, the presence of two crossbars seems clear, as in some vihuelas with a loop, as we can see in the vihuelas provided by one or more mouths, such as the vihuela de arco de Játiva.



However, in most cases, they would probably have a single bar, longitudinal, glued just below the junction of the two halves, on the shaft. The shape of the two "c's" facing each other and separated by a few fingers seems to show this, since, in the end, they come to be a memory of the previous and primitive circular opening, necessarily separated, in the manner of a parenthesis, to avoid that crossbar under them from being noticed.

The bar is cut from a block of spruce in a section slightly larger than the size of the bar that we see on the plan of each of the instruments. The grains should be parallel to the long faces of this piece. We will transfer the interior curvature of the board to the soundbar, taking care that it matches perfectly for its perfect union. We will give the board a slightly tighter arc than the board, so that when gluing it we will have to press on the ends, putting some tension on the board. A difference of two millimeters at each end of the bar is sufficient.

Once the bar is glued, with a small brush, we brush both sides to refine the bar.



Size of the inside of the lid.

The interior of the soundboard is carved by immobilizing the soundboard on a cradle that reproduces the volume of the exterior surface, or with some wedges that block and fix the board to the bench. In a similar way to that developed on the exterior surface, we begin the process with a gouge, emptying transverse grooves throughout the board. We must take special care not to exceed the desired thickness, which is marked on the plan. The work is completed with the brushes and scraper blades, leaving the surface perfectly smoothed.





Gluing the lid onto the instrument.

Once the pawns and the interior reinforcements have been attached to the vihuela, we will go over the upper edge of the fences, checking their flatness and then we will glue the board with the help of screws.

*El cuello de las vihuelas de
arco*





The neck of bow vihuelas.

Materials.

In the necks of the bow vihuelas I always use Spanish walnut wood. It is a hardwood, fine-grained, easy to carve. If it is well chosen, it is very beautiful looking. This wood is historically documented and the neck, floor and fences of the only preserved Spanish arch vihuela, in the Convent of the Incarnation in Ávila, are made of this material.

Clipping.

Using a template, which can be extracted from the plan, we will draw the cross-sectional profile of the neck on a block of wood. The dimensions of the original block are variable, depending on the type of vihuela to be built. In this case, adapted to a small vihuelica, which we built from the model of the painting "Adoration of the Shepherds". Jorge Alonso. C.1520, Museo Nacional del Azulejo, Lisbon Each plan includes the measurements of the original dimensioned block. It must be perfectly squared so that all subsequent operations can be satisfactorily concluded.

Once cut, we will mark the longitudinal axis, which will be the one we will use as a reference to draw the horizontal profile, based on the measurements and templates that we obtain from the plan.



Marcando el eje longitudinal del cuello.

Pin holes.

From the plan, we will draw on tracing paper or transparent plastic the outline of the headstock and the points where the pegs are located. We will transfer this template to our headstock and mark these points with a sharp awl. With the help of a drill press, we will open each of the holes. This operation should be done before any other, because this way, the drill bit does not damage the edges when drilling the sides of the headstock. We will use a 5 or 5.5 mm diameter drill bit.



Removal of the headstock and carving of the head.

Once the horizontal profile of the headstock has been drawn on the wood, the carving begins by marking some cuts with a chisel one millimeter away from the interior line, as a precautionary measure. Next, the carving begins with the help of chisels and gouges. A good, well-sharpened chisel initiates cuts with very controlled mallet blows. The width of the chisels to be used must be less than the interior space of the headstock, so as not to scratch the interior faces. Emptying the headstock can be made easier by drilling some holes that mark the maximum depth to which we must reach.



Iniciando el vaciado del clavijero.

The heads of the bow vihuelas had different shapes. Many appear without any ornamentation, especially in the oldest models, others were decorated with the carving of animal heads or spiral finials, which would later give rise to the typical snails of bow instruments. In this example, we'll carve one of these primitive snails. It is a simple model, easy for any beginner. The process consists of drawing the snail on the wood on the two horizontal sides and on the top side. The angular spaces between the two horizontal and vertical lines are emptied by small saw cuts and the work is completed with gouges and scraping blades with good burr and profile adapted to the curvature of the surface. It is one of the processes that would require some face-to-face support for beginners.

Side cuts where the rings are housed.

One of the peculiarities that the hand vihuelas and the bow vihuelas shared was the way of inserting the hoops into the zoque. In the following photographs we see step by step how these cuts open. Firstly, we will draw them on the wood, with the angle defined on the plane and we will open two cuts with a Japanese saw spaced 1 millimeter apart. This distance, added to the approximate 4 tenths of each cut, will give us the necessary space for the rings or fences to enter without problem.

Neck size.

The carving of the neck begins by cutting with a saw the wood that exceeds the curve of the zoque. This initial cut is deepened until we reach the transverse and previous one, which we had made to insert the rings. From this moment on, the neck is carved, until we approach with the gouge cuts near the section curves indicated in the plan. In this process, we will also use neck blades and scraping blades, to finish the surface with sandpaper adhered to a wooden block, or loose, surrounding it.



Tallando el cuello con la gubia



Tallando el cuello.

*Primera fase de montaje de
las vihuelas de arco*





First phase of assembly of the bow vihuelas.

Trimming of the upper pieces of the frames and inlay in the socket.

Once the vihuela surrounds have been bent, we will adjust its longitudinal measurement to the needs of the template. We will cut each of the three pieces into which the two lateral frames are decomposed and adjust their curvature to the mold. It is very useful to make a few cuts to the mold in the corners, to immobilize the rings in them during this process. Then we will fix them, taking the horizontal plane of the ground as a reference. Once the fence is thus placed, we will take care that it rests well on this plane and that from it it maintains an angle of 90° in relation to the mold, all around it. In this process we need a board that performs the functions of support, with the same silhouette as the mould itself on the outside and with an extension that reflects the projection of the neck, in the manner of a screed.

On the support board, the longitudinal axis is traced with a pencil. This line is essential so that the instrument is perfectly aligned later on. Next, we mark on the neck of the instrument its own axis of symmetry, both in its upper plane where the tuning fork will later be glued, and in its lower part, around the socket and on the head or headstock itself.

We mark the exact angle on the fence by transferring it from the one we practiced in the lateral cut of the socket and cut it. We immobilize the neck with the help of a tool that we have previously built and which consists of a board of the same width as the neck, to which we attach two other verticals that will have the same height as the vihuela, taking into account that the height maintains an angular deviation, as can be seen in the map. This procedure allows us to immovable the mold and the neck of the vihuela by reproducing the spatial configuration that we want to give it.

Gluing the three pieces of the fences together to form the crown.

Once the two upper pieces have been glued, we will glue the central "c" shaped pieces of the instrument onto them. First of all, we will put the corners with strips of masking tape to prevent the frames from sticking to the mold. Next, we will adjust the pieces to the measurements of the mold, cut them and glue them with the help of some parchment reinforcements. In later instruments, this reinforcement would be replaced by a spruce or pine wood slat fitted to the same angle of the corners of each instrument. We prefer, at this time, to respect the materials of the older instruments. Although we do not know for sure whether this was the procedure, at least we find it in some early Italian instruments, which most likely maintained the previous Spanish procedures.

Once one of the "C" s has been glued, we will repeat the procedure joining it with the lower frame. This third piece must fit very well to the shaft, at the height of the cylinder head, or better yet, exceed it by a few millimeters as a safety measure. Once the three pieces on one side have been joined, we will glue those on the opposite side.



ros la línea de corte que deb





The "truss" of the vihuelas.

As we explained in the section dedicated to joining the rings and the neck, the lower end of the rings, or rings, is cut in the vertical coincident with the longitudinal axis of the instrument. From this line, the classic "v" of the vihuela truss will be marked.

Firstly, we will immobilize the instrument by placing it on a very firm bar, immobilized with sergeants. This strip flies a few centimeters from the carpentry bench and in that space, we will fix the mold of our vihuela.

We find this solution in several historical instruments since the 16th century and it is maintained in different later instruments as we will see. In the succession of images, organized sequentially, the entire process can be followed in detail



Vihuela immobilized on the bench.



Marking the angle of the truss.



Cutting the angle of the truss.

The rest of the processes are carried out the same as in the hand vihuela.

*Segunda fase de montaje.
Perfilado*



Second phase of assembly of the bow vihuelas

Gluing the floor.

First of all, we will go over the fences around their perimeter with the large blade chisel. The crown of the frames, already attached to the neck and closed at the bottom by the stock, is immobilized by the mold. We will check its perfect symmetry and check the linearity of its cuts, carefully going over with the brush so that it is perfectly level. To check this, we will place transverse slats on the rings at different distances, verifying that they are perfectly aligned in relation to the mast.

Next, we immobilize the vihuela again with the same tool that we used when fitting the fences into the zoque and place it again on the floor. Place the floor between the screed and the fences, after applying the glue, tightening the joint with the tightening screws.

The laborers of the bars.

Pawns are pine rods that are carved from 8 x 8 x 50 mm slats. They are carved with the chisel and the knife.

It is another of the characteristic solutions of Spanish violeria compared to European violation. Bar pawns have a triple function. On the one hand, they guarantee that the lid fits perfectly on the rings without deviations, on the other hand, they reinforce the joint, which in the case of the lid is very subtle, as it lacks counter-rings and linen reinforcements at its junction with the frames. Finally, they perform an important acoustic function, such as vertical ribs for the transmission of vibrations.

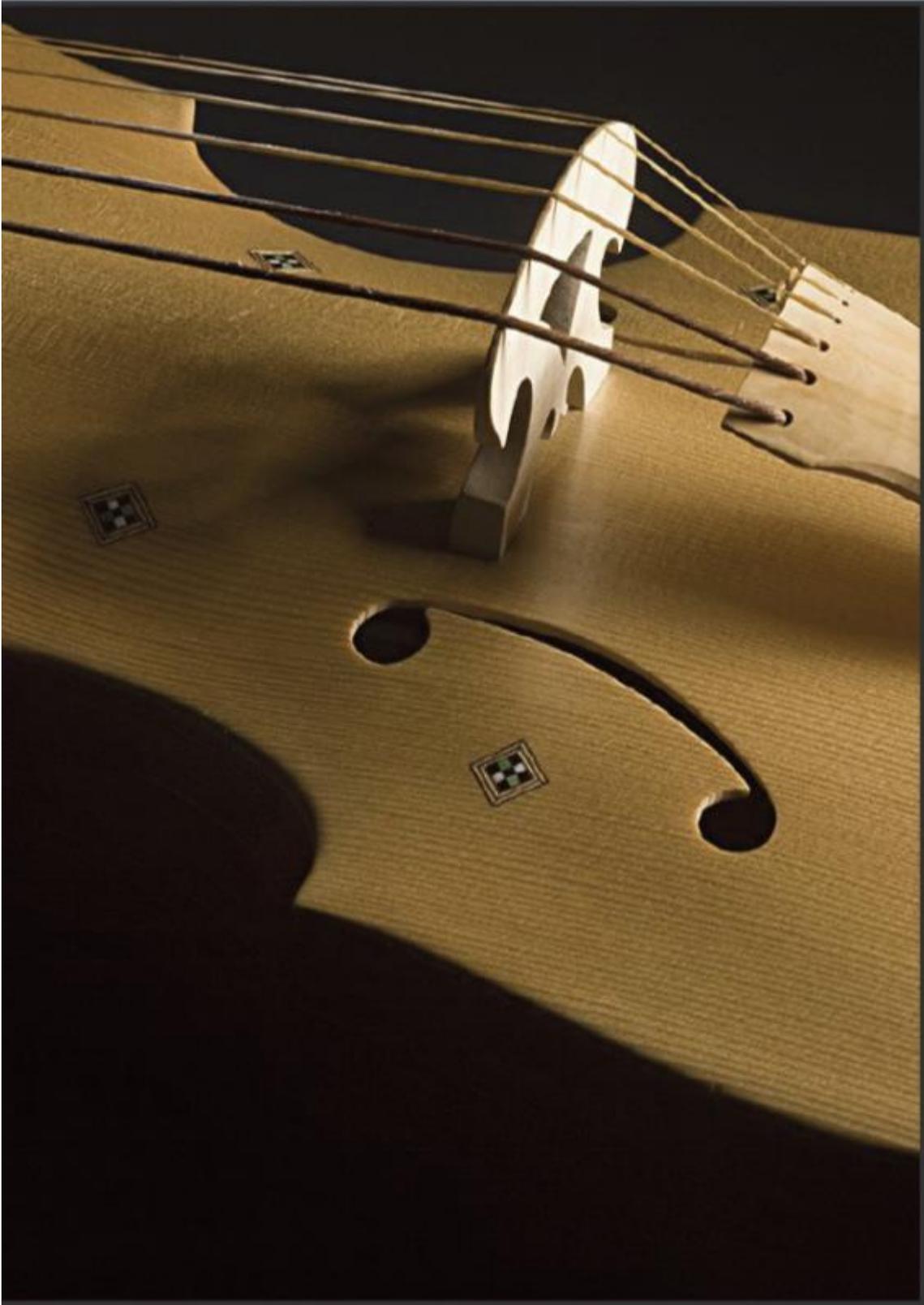
Linen interior reinforcements.

The union of the hoops and the floor, in the hand vihuelas, in the bowed vihuelas, harps, guitars and other instruments, were reinforced with linen glued to the apex. Viol makers' ordinances required instruments to carry these reinforcements, as a guarantee of quality and durability. We will maintain this traditional procedure, which has a great importance in the architecture and sonority of the instrument. There are those who have abandoned it and use counter-hoops, which is absolutely unscientific, since wooden counter-hoops are developed much later.

The old linen, which is no longer on the market, is of excellent quality, it is much thicker than what we currently find in fabric stores. It's hard to find, but it's still possible. Some of the grandmothers' old sheets are made of this magnificent linen.

*Diapasón, cordal, clavijas y
clavijeros de las vihuelas de
arco*





Fingerboard, tailpiece, pegs and pegs of the bow vihuelas.

The tuning fork

Most of the bow vihuelas of the 15th and first half of the 16th centuries had the plane of the fingerboard aligned with that of the upper edge of the frames, without any angle between the two. This primitive characteristic was shared by early instruments of the violin family. In order to raise the angle of the fingerboard and thus bring it closer to the strings, a wedge system was devised, which allows the adjustment and height of the strings to be regulated. In the plans of the different bow vihuelas we can see this configuration. To build the complete fingerboard, we will first need a strip of pine wood with dense grain and arranged perpendicular to the horizontal plane.

On both sides, two walnut slats are attached. The three pieces will always be somewhat larger than the measurements expressed on the plans, in width, height and length. Only when they are perfectly glued will they be planed so that they fit snugly around the neck and lean at the desired angle.

We will calibrate a boxwood or ebony wood slat, leaving it at a thickness between 1 and 1.5 mm. A 1 mm sheet metal is easier to bend, but it is preferable to take a risk with a 1.5 mm one, since at the end of the process, we will have to go over the linearity again and remove some more wood. To bend it and adjust it to the core of the fretboard, wet one of its sides with a brush dipped in water and let it rest for five or ten minutes.

We will give it water once more and then place it on a turned wooden cylinder, approximately 8 to 10 cm in diameter. We will surround it with a rope that we will progressively tighten until it is perfectly adjusted to this base and we will let it dry for two or three days. Once dry, we will stick it on the web, using a rope again, this time with a single pass, taking care that the rope does not mount on itself at any point on the surface, to allow it to be trodden uniformly by the slats later. A first strip, with a square section of approximately 15 x 15 mm, is fixed at both ends with a clamp, perfectly aligned on the axis, on the rope. We will place another two of these slats on the edges of the fretboard and we will also hold them with two tweezers at their ends.

Finally, we will go around the three slats again with a rope, taking care that they do not move. Una vez seco el diapasón, con su chapa encolada, ajustaremos el ángulo según se indica en los planos y vaciaremos la parte inferior, que quedará sobrepuesta a la tapa, dándole una concavidad paralela a la superficie.



Lijando el diapasón sobre un plano.



Mojando con agua la superficie de la chapa.



Domando la chapa.



Rodeando la chapa sobre el cordal para pegarla, antes de poner los listones.



Marcando los puntos para cepillar el diapasón y alinearlo al cuello, en el ángulo correcto.



Dibujando la línea base.



Cortando el arco que queda sobre la tapa.

The tailpiece.

The fingerboard of bowed vihuelas can be constructed by various procedures. There were some that appear in the iconography with a completely white coloration, implying, probably, that they were made of a solid piece of bone or ivory. They can be carved, in the same way, in a solid piece of boxwood, or other very hard woods, but it is preferable to follow the procedure that we propose below, because, in addition to being much more resistant than in solid pieces, it allows you to reach lower thicknesses and, consequently, a lighter weight.

We will prepare three pieces of boxwood, as always a few millimeters longer and wider than the sizes of the tailpieces we want to build. The thickness for these sheets can range from 1.5 to 2 mm. Each of them will be folded, following the same procedure that we have proposed for the batter. Once dry, they are glued together with the help of tweezers, taking care that there are no air pockets between them. Of course, we will always use hot glue. It is preferable to glue two together first, and then glue the third when this first joint is dry. If you don't have three sheets of boxwood, we will use two sheets of walnut and the top one of boxwood.

Once the joint is dry, after a couple of days, we will glue a cross slat to the widest part of the tailpiece, the one closest to the bridge, to reinforce the space where the holes for the strings are drilled.

We will mark in the lower part, narrower, four holes for the staff of the stock with which we will fix the tailpiece that starts from the button. The staff is knotted at one end and, regulating the correct length, we will cut the beautiful crossing of the staff through the four holes, to finish the operation with a new lower knot. The knots are heated with a lighter so that they cannot come loose.



Pegando la chapa transversal.

Pegs.

Violin pegs or other instruments should not be used, as is often the case. Inadequate pegs always make the instrument ugly and if they are not contemporary, they introduce an element of anachronistic distortion that ruins a work of many hours. For this reason, it is preferable to turn them, and, if you do not have a lathe, to order them from a careful turner, with the indications that appear on the plans.

Normally, turners send the pegs without finishing the head. In this case, a cylinder can be built, wrapped in sandpaper that is fixed in a drill, or better yet, in a lathe, facilitates the work of the heads.



Dibujando la silueta del cordal.



The pegs can be made of different woods, we always prefer boxwood over any other, as it is a native wood, which was frequently used. Ebony wood was also used for this purpose.

Tuners.

As we said on the subject of the necks, the bow vihuelas were finished off with a stylized animal head, a fantastic griffin or monster, or spirals that announced the later snails of the bowed instruments.







Terminación y barnizado





Finishing and varnishing

Trim any excess from the top and bottom.

The excesses of the top and bottom of the vihuelas, which protrude from the frames, are trimmed with Japanese saws, gouges, sharp razors and scraping blades. All these tools are valid for this operation and useful at different times. Care must be taken in this process not to damage the fences with saw cuts or scratches from sharp tools. Finally, we use a medium grain sandpaper wrapped in a wooden block and then, another very fine one, with which we will sand the entire surface of the rings, top and back. If we want to wait and eliminate all the remains that the sandpaper leaves inside the pores of the wood, we can use a curved, straight-cut glass, without mordants, to extract them. It is a slow process that requires patience, but it helps improve the final appearance of the surface and frees the wood of dirty remains that cloud the sound of the instrument.

Is it advisable to spread filler on the surface? Doubts about the varnish used on musical instruments in the 14th and 16th centuries.

The criteria of certain luthiery schools, which advise smearing the wood with mixtures of gum arabic, tragacanth and other components before varnishing the surface, must be discarded. The latest research on varnishes shows that such treatments did not exist on ancient bow instruments. Stradivarius himself spread the varnish directly, without prior covering, as demonstrated by analyzes carried out at the Musée de la Musique in Paris. Despite these conclusive tests, some insist on maintaining the filler, so that the varnish and even less the pigment does not get into the wood. The final appearance of this form of varnishing homogenizes the surface, turning the varnish into a foreign, superimposed layer, not integrated into the wood and lacking the depth that is achieved with direct application.

We are not in favor of this treatment, nor the use of acids or other chemical substances that damage the wood. Perhaps, at most, we could admit egg white, but we also have no evidence of its use in hand or bow vihuelas. The truth is that the varnish that was applied to these instruments is an enigma. Perhaps research into the varnish of the preserved historical vihuelas, if it is original, could clarify these doubts. In the case of valuable instruments, made of noble woods and profusely decorated, the use of protective oils or varnishes is almost certain. Although we do not directly know formulas for varnishes used in violence, these would not be very different from those usually used in contemporary carpentry or painting.

Francisco Pacheco, Velázquez's father-in-law, published "Art of Painting" in 1649. In his treatise he includes a detailed description of the varnishes known in his time and their method of preparation, which out of his interest, we transcribe in full:

Of various types of varnishes and how they are made:

And, therefore, we remember the varnishing of the eyes, it will be fair to shed some light here on the differences in varnishes that have come to my attention, so that each one can take advantage of the one that best suits them. And starting with the most common one, which the guadamacileros use, it is this way.

1. Taking half a pound of linseed oil in a glazed pot, and putting it to boil over coals well lit with coals, being very hot, add three heads of peeled garlic, which they cook with it, and when they are golden take them out, and put a hen's feather to see if it is cooked, and when it comes out burnt, Add four ounces of powdered ground fat, which is the gum of the

juniper, which the Arabs call sandaraca, (Dioscorides, chapter 33) and cook until the knife looks like it has a body that is sufficient, and the greater the quantity of oil, the more it is poured, respectively, and if you want to do better, it can be lavender or hoceima oil without adding garlic.

2.- Another varnish is made of mastic powdered and passed through a sieve, and covered with walnut oil and placed in a pot over a calm fire, it must be stirred until it is dissolved, and when removed from the fire add a little oil of Al Hoceima, and you can make the amount you want of this varnish.

3.- Another varnish is made by taking in a pot the suitable quantity of lavender oil and ground fat powder, with a cloth tied inside ground mastic and to the embers and calm fire; When the fat is dissolved, remove it from the heat and take out the cloth, and add a little brandy of the strongest kind, more or less, as you want it to be loose.

4.- El cuarto será cualquier barniz de sombra; liquidarlo y adelgazarlo con aceite de espliego al sol.

5.- Another is made by putting two ounces of good brandy and one ounce of very finely ground mastic in a glass vial and putting it over low heat until they are incorporated into each other; and being away from the fire and cold, pour two ounces of oil and cover it very well.

6.- Another varnish of this kind: take two ounces of very thin powdered fat and two ounces of seven-cook brandy and half an ounce of lavender oil and put it on a low heat until it is well mixed, and it is wonderful on boards.

7.- For paintings there is another very good varnish with two ounces of linseed oil and another two of pine gum and one of toad oil, all dissolved over a gentle fire.

8.- Another is made this way: one ounce of benzoin and two of brandy boil seven times and add them over low heat, and while hot, add half an ounce of white-veined turpentine.

9.- The last one with which we will end this chapter is like this: to one ounce of turpentine, another ounce of very clear French vein turpentine; You must have the turpentine itself in a small glass, which must be placed in the heat of the gentle coal fire until it is dissolved and then remove it from the heat and add the turpentine with a clean stick, stir it very well until it becomes dissolved. incorporate one with the other; It should be kept liquid and good for at most a month and it is best to make it fresh for each frame..

This interesting text offers us an authentic compendium of all the varnishes known to Pacheco. Although the formulas that Pacheco was interested in were those that could be applied to paintings, varnishes used for other purposes are also described here, such as the first of them, that of the scythe-makers. It is likely that some of them could have been used by the violists. In any case, if we want to apply some varnish on our vihuelas, it would be desirable to resort to one of these old recipes. The basic components were gums, or residues extracted from different plant species, diluted in oils or spirits of various co-ce-duras. For the previous treatments of the wood, we find several allusions to the use of garlic. In addition to being used to cook the mixture of sandaraca and linseed, garlic was used to prevent the resin from oozing. The gilders, before spreading the stucco on the surface of the wood, treated it by rubbing garlic on it and then adding a thin layer of skinny glue or gíscola.

The fat, or sandáraca, so widely used in the varnishing of different musical instruments, is now understood to be extracted from a tree species of the genus *Juniperus* common in North Africa. The treatise writer Laguna, in his translation and interpretation of Dioscorides, to which Pacheco refers when describing the second formula of varnishes, comments on the matter:

“There flows from the juniper a certain gum similar to mastiga, which is called vernix and sandarax in the Arabic language, whereby some idiots, corruptly, give it the name of sandarach,

since (read though) the sandarach of Dioscorides and of According to all Greeks, it is a kind of red orpiment, poisonous and very corrosive. For this reason it is worth noting that wherever we find written in the books of the Arabs, sandáraca, we must understand the gum of the juniper tree, which we vulgarly call "fat" in Castile as orpiment when in the books of the Greek authors we will see it. This juniper gum and linseed oil is made into a liquid varnish that is very useful for giving paintings a good luster and for varnishing all types of iron."⁵

Mastic gum is used in three of the nine varnishes, being the fundamental base in two of them. About this rubber, we have interesting news from Dioscorides:

*"Bring us your resin from Arabia Petra, it is also born in Judea, in Syria, in Cypro, in Africa, in the islands called Cyclades. The white, the transparent, the one that has the color of glass, declining over the blue, and the one that gives of itself a soft smell typical of terebinth, is considered to be better. It has great advantage to all terebintine resin. After which it is second in virtue that which it distills from mastic."*⁶

Dioscorides in book I, chapter 71, also comments the following in relation to mastic "*Lenticus also produces resin, which some call lentiscine and others call mastic.*"

Finally, the other two gums used by Pacheco varnishes were white vein turpentine and French vein turpentine. These substances, according to Font Quer, were extracted from the bark of the terebinth, bleeding it. It was called turpentine from Chio, which is the turpentine par excellence, already known by the Greeks and Latins with the names of terebinthos and terebinthina, names that they gave, in ancient Castilian, to trebentine and from this to turpentine. As for the vein turpentine of France, it probably alludes to a type of turpentine cited by Dioscórides:

The liquid resin that is distilled from pine and spruce is brought from France and Tuscany. However, in ancient times it was brought from Colophon, an Asian city, from where it came to be called Colophonia. A kind of resin is also brought from that part of Galatia that is neighboring the Pes, which the locals call laricin.....it also distills a liquid resin from the cypress, which is useful for most things. Of the dry resins, one comes from pine cones and is called strobilin; another from the fir tree; another from the spruce and finally another from the pine...

Pacheco varnishes can be classified into three categories depending on the binder used: oil-based, brandy and mixed varnishes. The first group includes varnishes numbers 1, 2, 4 and 7. Different oils are used in them: linseed, alhucema, lavender, walnuts and the curious toad oil. Numbers 3 and 6 are mixed, mixing lavender oil and brandy, while varnishes 5 and 8 are brandy. The brandy was used

⁵ LAGUNA, Andrés de. *Pedacio Dioscórides Anarzabeo, acerca de la materia medicinal y de los venenos mortíferos*. Salamanca, 1570. Los textos de Laguna los hemos extraído de Font Quer, Pío. *El Dioscórides renovado*. Barcelona, 1981

⁶ DIOSCÓRIDES, *Materia Medica*, libro I, capítulo 72. Siglo I después de Cristo.

before the knowledge of alcohol, almost as pure as alcohol, after so much distillation. In varnish number 9 we find turpentine as a binder.

The varnishing.

Before varnishing, if we decide not to impregnate the wood with filler, we will moisten it slightly with a cloth. In this way, after a few hours, the wood repellent that still remains inside the pore and the loose strands protrude to the surface. Sanding with very fine sandpaper will leave the surface very polished, but it is advisable to then gently burnish the surface again to clean it of impurities, with a very rough chamois and even with a bone, as the gilders did, lubricated with some drops of milk. In any case, before using these procedures we strongly recommend doing tests on pieces of the same wood that we are going to varnish, since even different woods of the same species have similar behaviors.

With the surface already prepared, dry and very clean, we will begin the varnishing, spreading it with brushes with sable or ox ear hair. Each coat of varnish will require 24 hours of drying and very fine sanding before applying the next coat. Between coats and sanding, we will clean the surface again first with a dry cloth and then with the chamois, polishing a little at the same time. It is not advisable to go over the number of coats, which will also depend on how thick the varnish is. 6 or 7 will be sufficient in principle. In principle we will not use any dye, especially in hand vihuelas. In the bow ones, it could be interesting in any case to add, starting with the third coat, some natural pigment, extracted from the shell of the green walnut or the galls, which give very interesting brown tones. Oxides and earths can also be used, with great caution and prior testing.

A poorly given varnish, due to the use of defective or inappropriate varnishes, can ruin an instrument. We offer a respectable assortment of historical varnishes that can be used with full guarantee and are easy to apply.

Polished.

The final polishing can be done with the help of a doll, formed by cotton wrapped in a piece of pure cotton fabric. It is a delicate process that we only recommend to those who have already varnished an instrument, because if done incorrectly it can ruin the instrument. On the doll, pour a few drops of varnish and a mineral oil, Vaseline, which helps facilitate the movement of the doll. You have to spend a lot of time on this final operation. The finish is impeccable. We have doubts, however regarding this procedure, we do not know if it was used in the centuries of the vihuelas. An excess of final polishing gives the instruments a perhaps unnatural shine, which does not convince us.

9/4/22



V.- EVALUATION

As planned, results were evaluated on a quarterly basis and milestones were met. The qualitative and quantitative objectives have been achieved, and the students have actively participated in the project. Six hand vihuelas and three bow vihuelas have been completed, also exceeding those project objectives.



VI.- DISSEMINATION

The results of the project have been disseminated by the following means:

1.- National Radio of Spain, national program “Longitud de Onda” , through the following monographic programs for the dissemination of the Art of Violería:

Marzo de 2021: “Mujeres violeras” <https://www.rtve.es/play/audios/longitud-de-onda/habia-mujeres-violeras-s-xvi-si-02-03-21/5807462/>

Abril de 2021: “La piel de las vihuelas” <https://www.rtve.es/play/audios/longitud-de-onda/piel-vihuelas-06-04-21/5834892/>

Mayo de 2021: UN violero en el tribunal de la Inquisición
<https://www.rtve.es/play/audios/longitud-de-onda/violero-tribunal-inquisicion/5894547/>

Junio de 2021: De profesión, violero <https://www.rtve.es/play/audios/longitud-de-onda/profesion-violero/5924779/>

Other radio programs:

https://cadenaser.com/emisora/2021/02/12/radio_zaragoza/1613133103_204122.html

<https://sienteloconoido.es/javier-martinez-violero-entrevista-en-la-escuela-de-violeria-de-zaragoza/>

<https://www.diariodelaltoaragon.es/noticias/cultura/2021/04/06/el-proyecto-delyramus-llega-hoy-a-la-sala-cai-de-huesca-1482929-daa.html>

2.- Facebook, different news published on our page: <https://es-es.facebook.com/EscueladeViolerosZaragoza/>

3.- News published on the web: www.escueladevioleros.com

4.- News and reports published in the Aragonese press, radio and television.

5.- Visit of the Deputy Mayor of Zaragoza to the Escuela de Violería:

<https://www.zaragoza.es/sede/servicio/noticia/303360;>

https://www.zaragoza.es/ciudad/educacion/listado_Noticia?tema=Educaci%F3n&texto=&id=&espacio=1&inc=30&numpag=1

6.- Promotional video made by the Ministry of Industry, Commerce and Tourism, on the occasion of the selection of the Violería School as a finalist for the National Crafts Award.

<https://vimeo.com/651463360>; https://www.arquitecturaydiseno.es/estilo-de-vida/estos-son-15-finalistas-premios-nacionales-artesania_6577

7.- Different news published on the occasion of the First Prize of the Philharmonic Society of Zaragoza, awarded to the Escuela de Violería. <https://auditoriozaragoza.com/programacion/escuela-de-violeros-de-zaragoza/>;

8.- Different news published on the occasion of the celebration of the Wood, Heritage and Ecological Transition summer course, held in Guadalaviar, Teruel and organized by the University of Zaragoza and the Zaragoza School of Violería: <https://earea.es/eventos/54-curso-de-geologia-practica-la-provincia-de-teruel-recurso-didactico-para-aprender-geologia-235-526>/<https://www.diariodeteruel.es/comarcas/el-curso-de-madera-y-patrimonio-de-la-uvt-nace-para-quequedarse-en-guadalaviar>

10.- At the European level, the inclusion of the School of Violería on the Crafts Code website is very notable, as a good management practice..<https://www.interregeurope.eu/policylearning/good-practices/item/5394/new-opportunities-for-violin-making-art/>

11.- News in Latin America: <https://www.notimerica.com/cultura/noticia-latinoamerica-violero-artesano-aragones-javier-martinez-recibe-premio-nacional-artesania-20221216191100.html>

Id. La NACIÓN, Argentina: <https://www.lanacion.com.ar/agencias/el-violero-y-artesano-aragones-javier-martinez-recibe-el-premio-nacional-de-artesania-nid16122022/>

12.- News of the signing of the agreement between the University of Zaragoza and the School of Violería, Zaragoza, April 27, 2022. <https://iphunizar.com/actividades/actualidad/convenio-con-la-escuela-de-violeria/>

13.- National press, La Vanguardia: <https://www.lavanguardia.com/vida/20210627/7560189/javier-martinez-violero-instrumento-vivo.html>

14Other news: <https://aragondigital.es/cultura/2021/06/18/la-escuela-de-violeria-se-traslada-a-la-antigua-sede-de-la-sociedad-cultural-los-amigos-del-arte/>

HERALDO DIGITAL: <https://www.pressreader.com/spain/heraldo-de-aragon-be/20221217/282432763209116>

15.- AMUEZ: <https://www.amuez.es/visita-cultural-taller-de-violeros-de-zaragoza/>



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