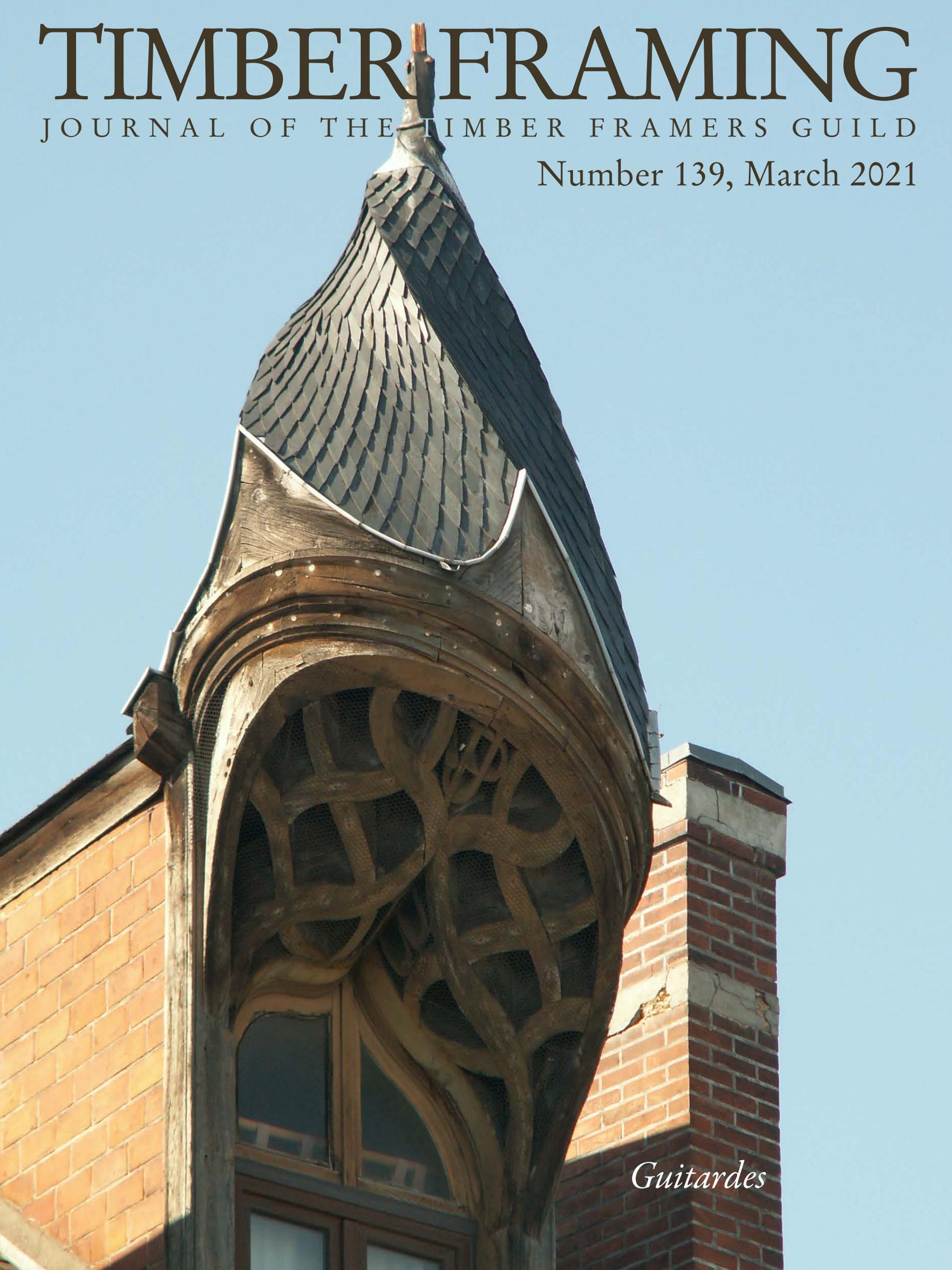


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*Guitardes*

# Stereotomy and the Guitarde

**T**HE *guitarde* (see Fig. 1) is often viewed as the height of the carpenter's art among the French *Compagnons du Devoir*. Many examples of these complex dormers were built (and can still be seen today) in every region of France, from small villages to the bourgeois quarters of large cities. *L'art du trait*, the particular form of stereotomy that is the compagnons' system of developed drawing, enables the execution of this work. This article presents an overview of the history of the guitarde form, with some details of its joinery and its carpenters, along with an introduction to the topic of stereotomy.

**History** The *lucarne*, or dormer window (from the Latin *lucerna*, meaning lamp), has been used in France to let light into attics since the 13th century. Its prominence increased as upper stories became more common, particularly in small domestic buildings. Dormer windows enabled the creation of an additional story of fully lit rooms above the building's eaves line.

The earliest dormers were very functional and simple (Fig. 2). Architects later adopted dormers into their designs, using them to emphasize vertical lines of symmetry, framing each dormer window with pediments and other detailing, usually in stone.



Didier Descouens, Wikimedia Commons \*



Andy Hyde



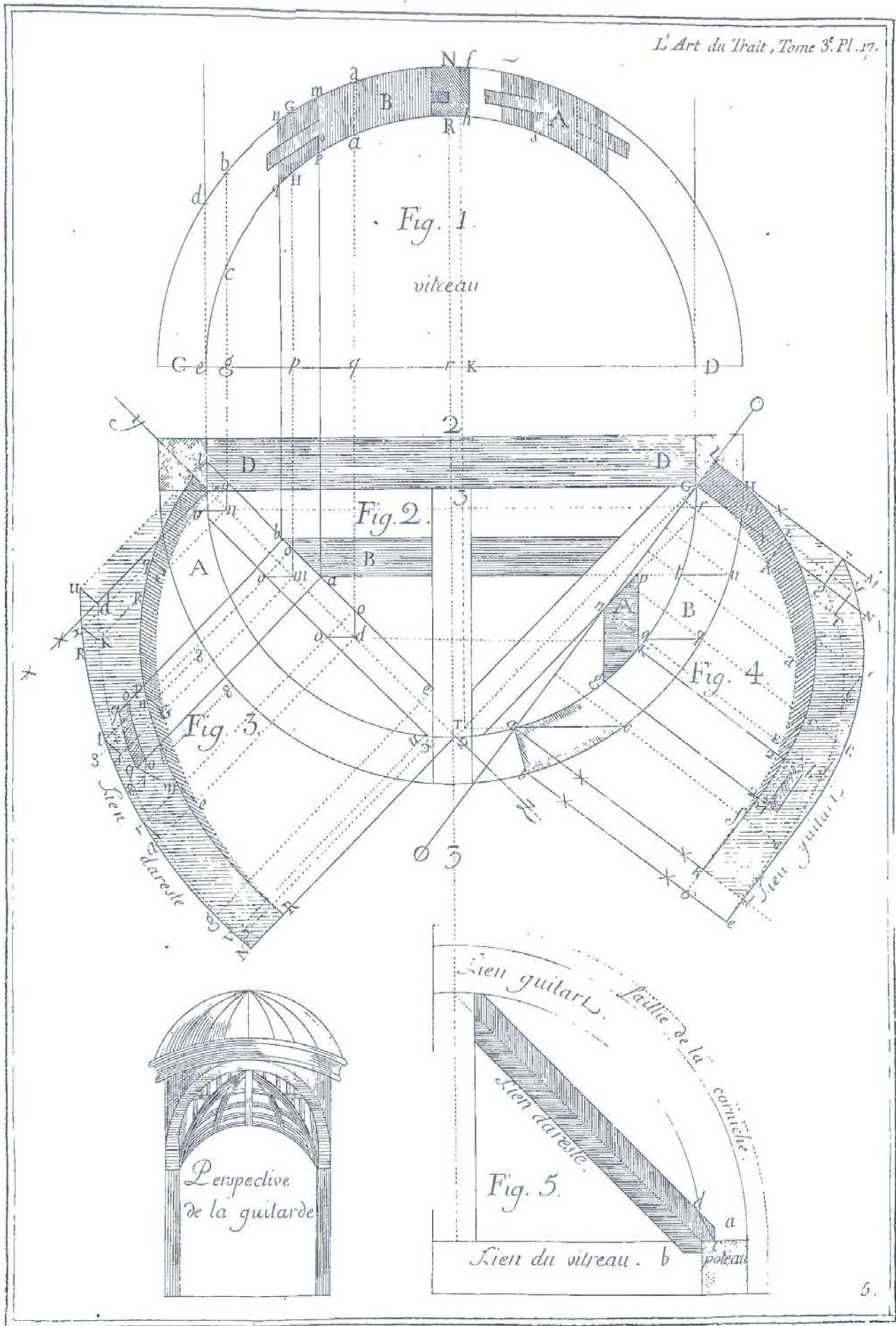
Adam Miller

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1 A pair of guitarde, as supports for a balcony and canopy, framing and protecting a portrait of Père Soubise, one of the mythical founders of the *compagnonnage*, at the Musée du Compagnonnage, Toulouse, France. Note the letters included in the structures: below, PAIX (peace), and above, the symbolic letters UVGT.

2 Early dormers in a very narrow street of Troyes, France. Simple and functional, the left example retains its hoist sheave. Braces are curved, but lie in a single plane, as do the Saint Andrew's crosses on the right.

3 Early guitarde by Nicolas Fourneau, built in 1765 for the Hôtel du President de Bailleul, Rouen, France. Note the now-abandoned attachment point for a hoist sheave.



4 Working drawing for Fourneau's guitarde, plate 17 in the third volume of his 1767 *L'Art du Trait de Charpenterie*.



Musée Départemental du Compagnonnage

5 Stereotomy class photo. Pierre-François Guillon at left, with large dividers. Note the several large masterpieces and large-scale drawings on wall, which are on display at the museum dedicated to Guillon's school.



Tim Whitehouse

6 An elegant guitarde sheltering an entrance to the compagnon house in Samur, France. Note how the form can be conceptualized as three cylindrical volumes intersecting at right angles.

The first documented example of elaborate dormers in timber is a pair of guitarde dormers designed and built in 1765 by Nicolas Fourneau, a Master Carpenter in Rouen, Normandy (Fig. 3). The term *guitarde* derives from the curvaceous character of almost all its components, said to resemble the body of a guitar. Fourneau was the author of the first French treatise in carpentry geometry by a working craftsman, *L'Art du Trait de Charpenterie*, which was published in 1767 and includes working drawings of these first *lucarnes guitarde*s (Fig. 4).

Fourneau's treatise was the culmination of nearly 20 years of teaching the techniques of carpentry stereotomy to his fellow guildsmen. It was the first attempt to compile techniques which until then had been the domain of individual Master Carpenters, who each had their own favored methods. (For more on *compagnon* culture, see "Symbolism and Ritual in Compagnonnage," TF 116.) By repeatedly setting out problems and testing the solutions with his students, Fourneau arrived at a set of techniques and procedures that could be formally taught, rather than only practiced on the worksite, where the apprentice and journeyman would learn by imitation of their master.

Many carpenters passed through Fourneau's classes, and the new standardized knowledge of *l'art du trait* quickly spread from Rouen and Paris, where he held his classes, to many other parts of France, notably the Loire Valley. Numerous professional schools devoted solely to teaching *l'art du trait* and its application to construction were established in the mid-19th century. The most famous of these was compagnon Pierre-François Guillon's *École Professionnelle Pratique de Stéréotomie Appliquée à la Construction* (1871–1923) in the village of Romanèche-Thorins, now a museum (Fig. 5).

The *lucarne guitarde* and its slightly less complex cousin, the *lucarne capucine* (see below), became the mark of quality in carpentry (see also "Pursuing the Guitarde," TF 121). Throughout the 19th century, clients wishing to hire the best available craftsmen would commission elaborate dormers to be built in their roofs, and carpenters, in a spirit of competition, would build increasingly complex dormers to advertise their skills. These structures are admired by professionals as well as the public, and may in some cases be regarded as true masterpieces (Fig. 6). Tempted by the possibilities of their knowledge, some carpenters certainly pushed the limits, occasionally creating heavy, dense forms that were far too complicated to respect elegant and harmonious proportion. One example (see front cover), by compagnon Pierre Bertrand, is an elliptical guitarde with a front elevation conforming to the shape of an imperial curve (a convex curve blended to a concave curve, with a pointed peak), inclined in both the side and front elevations, and supporting an equally distorted twisted-spire roof.

**Form, Structure, and Joinery** A guitarde is a composition of interlacing, double-curved wooden pieces that has curvilinear (typically either circular or elliptical) profiles in plan view and in both the front and side elevation views. The basic form can be visualized as the intersection of three cylinders centered on the x-, y-, and z-axes, though their diameters, relative heights, and cross-sectional shapes commonly vary. A related type of dormer, the *capucine*, is often confused with the guitarde. The difference is that, in plan, capucines are rectilinear, whereas guitarde's are curvilinear—the internal components of both are of double curvature (Figs. 7, 8, and back cover). The word *capucine* comes from the French *capuche*, meaning "hood," for their similarity to the hooded robes of the Capuchin monks. Both capucines and guitarde's are used as



Photographs this page by Adam Miller

structural support for a wide range of cantilevered roof structures, including dormer, balcony, and porch roofs, and as canopies above entryways, alcoves, and statuary niches (see Fig. 1).

In plan view, the circular or elliptical circumference of a guitarde is defined by a solid wood cornice, commonly adorned with detailed moldings, below the upper roof structure. This cornice is supported by two flanking, double-curved braces known as guitarde braces. The spandrels, or triangular spaces, created between the cornice and braces are often filled by curved paneling with decorative motifs (see Fig. 6). The space between the guitarde braces is filled with numerous double-curved pieces. Principal among these are *liens de tenailles* (pincer links), which are in part hips at the intersection of the curved front and side-elevation profiles, often taking on the form of irregular groin vaults. Pincer links are essentially curved

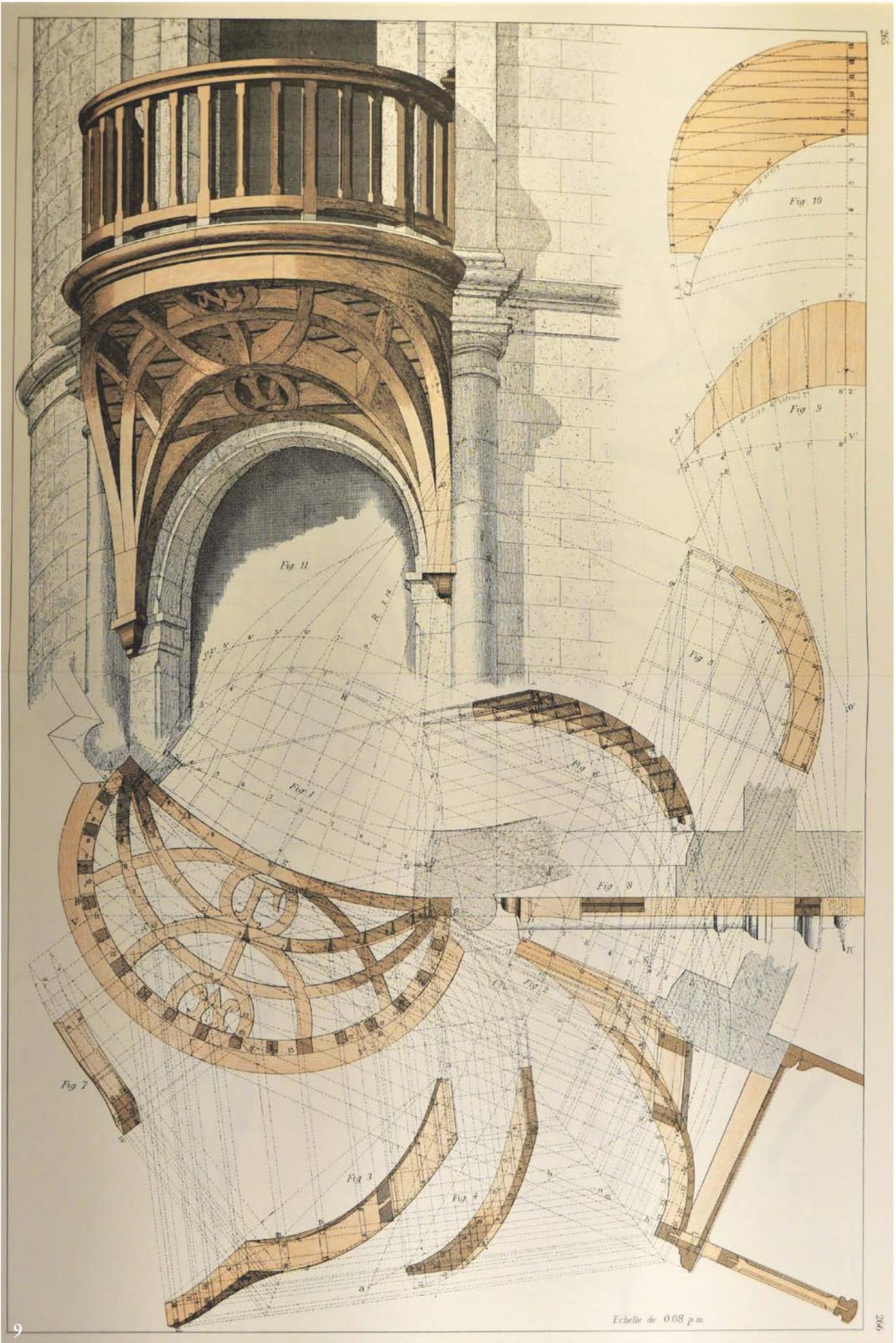
Saint Andrew's crosses that resemble a curule seat, a Roman chair style that symbolized political or military power (see "The Saint Andrew's Cross," TF 123). Note that Fourneau's guitarde (Figs. 3, 4) has hips that are straight in plan, rather than pincer links, indicating that the radii and elevation of the front and side elevation profiles are identical. Also in this space, often found between the interlaced timbers, are letters symbolic to compagnons, dates, initials, and diverse motifs, such as stars, crosses, and flowers (see Figs. 1, 14).

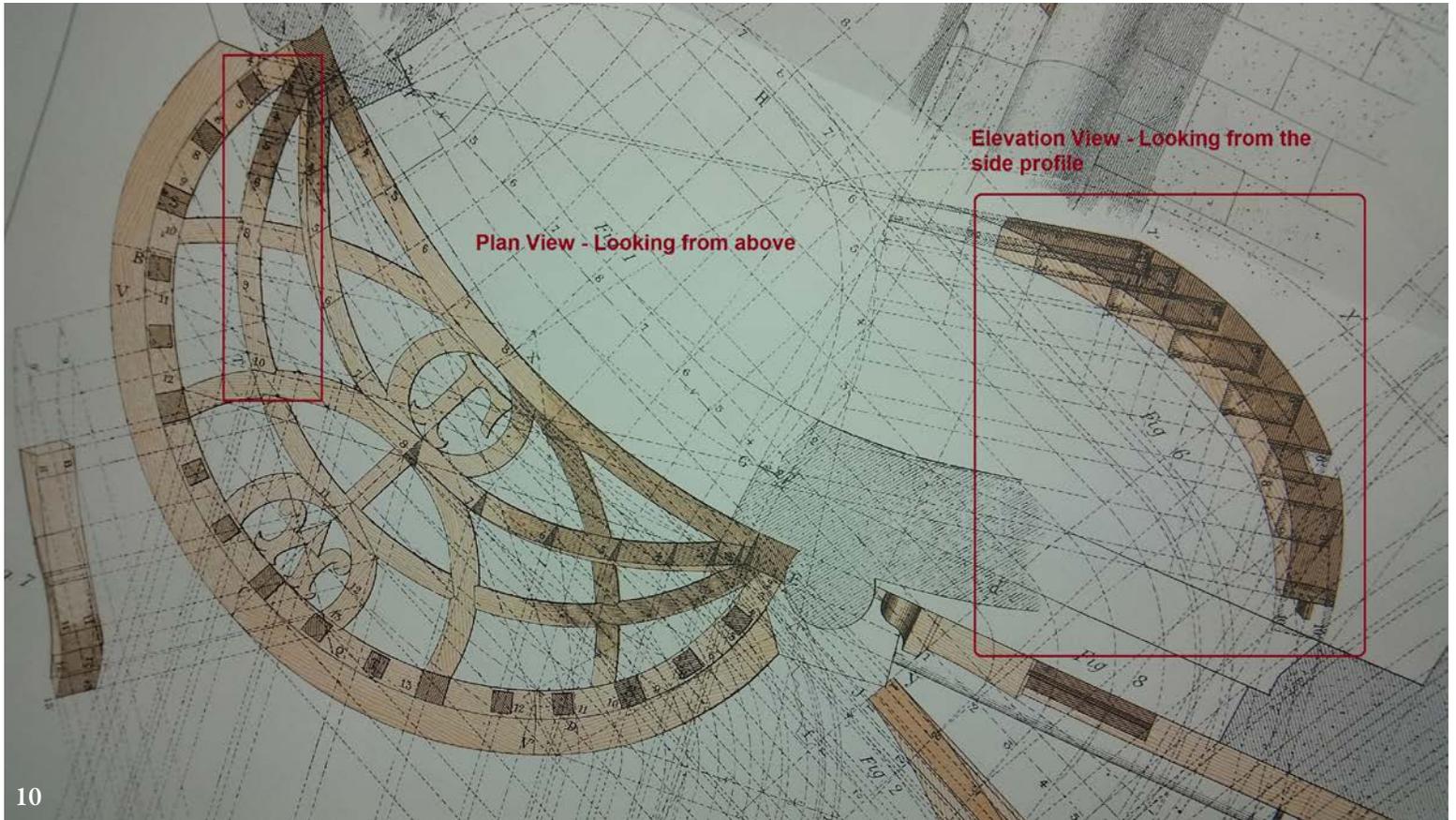
Although the methods are still taught and practiced, the use of traditional joinery in contemporary guitarde is somewhat rare—

*(Text continues on page 10)*



7, 8 Compagnon Hippolyte Moreau's compound guitarde, left, and capucine, right, clearly differentiate the two forms and showcase the possibilities within each. Châteauroux, France.





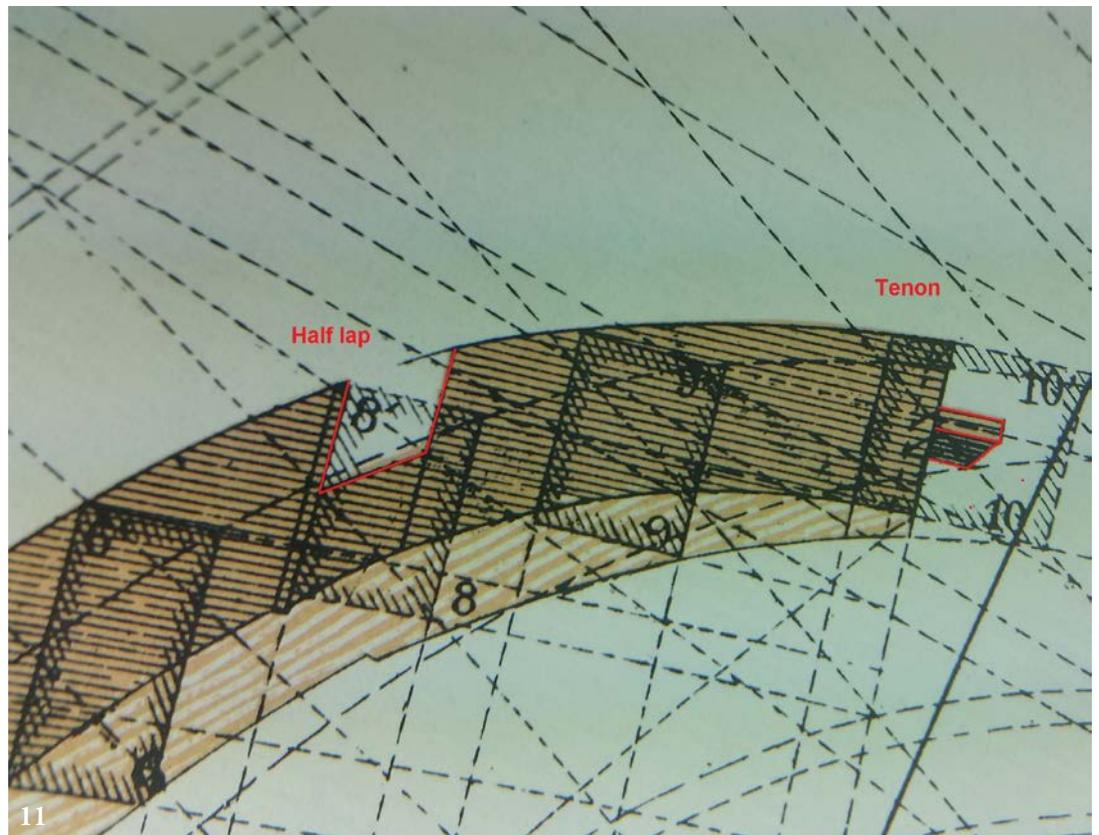
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Illustrations by Patrick Moore

9 The bottom half of Mazerolle's plates 109–10 shows the development of every dimension and angle necessary to construct the guitarde illustrated in perspective at top left. Note that this guitarde conforms to a circular wall and is conical in the front elevation. The drawings at top right develop the sheathing boards applied above the guitarde's curved elements.

10 The component in the red box at left in the plan view is shown in elevation in the red box at right. This piece, springing from the corner post, half-laps through another curved infill piece before tenoning into the pincer link at its top end. The shaded rectangles in the elevation delineate a succession of cross sections.

11 Detail of the half lap and tenon in the elevation of the component from Fig. 10.



11

(Continued from page 7)

using modern mechanical fasteners and glues, and even techniques such as glue lamination, can speed fabrication and produce very stable structures. However, much traditional guitarde joinery is simpler than the overall form of the structures might suggest. For example, Louis Mazerolle's famous 1866 treatise, *Traité Théorique et Pratique de Charpente*, details a very complex guitarde joined primarily with variations on the mortise and tenon and half lap. Figures 9–13, drawn from Mazerolle's plates 109–10, illustrate this point.

**What is stereotomy?** Stereotomy is the art and technique of cutting three-dimensional solids into particular shapes. The English term follows the French “stéréotomie,” derived from the Greek words for “solid” and “to cut.” The French compagnon carpenter Louis Mazerolle defined the term as “[t]he art of representing objects in section, elevation, and plan in order to cut them out.” Employing working drawings to design and fabricate structures both simple and complex, it can be thought of as a “universal language” for three-dimensional space. Stereotomy has long been used in the design and construction of European cathedrals, fortresses, and castles, including historically classified UNESCO (United Nations Educational, Scientific, and Cultural Organization) World Heritage Sites such as the Chartres Cathedral. In 2009, UNESCO included l'art du trait on its List of the Intangible Cultural Heritage of Humanity.

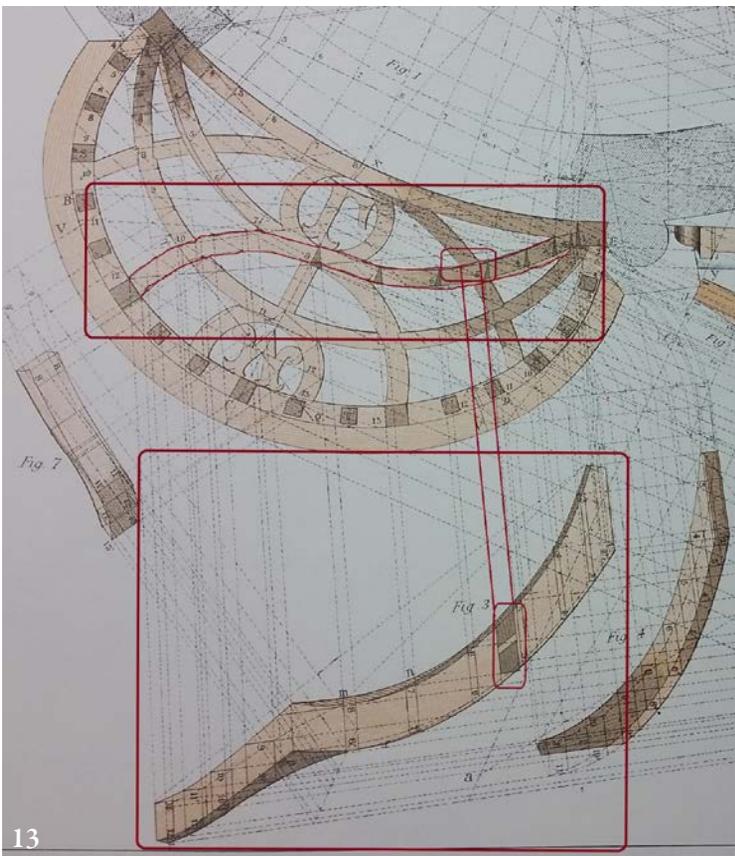
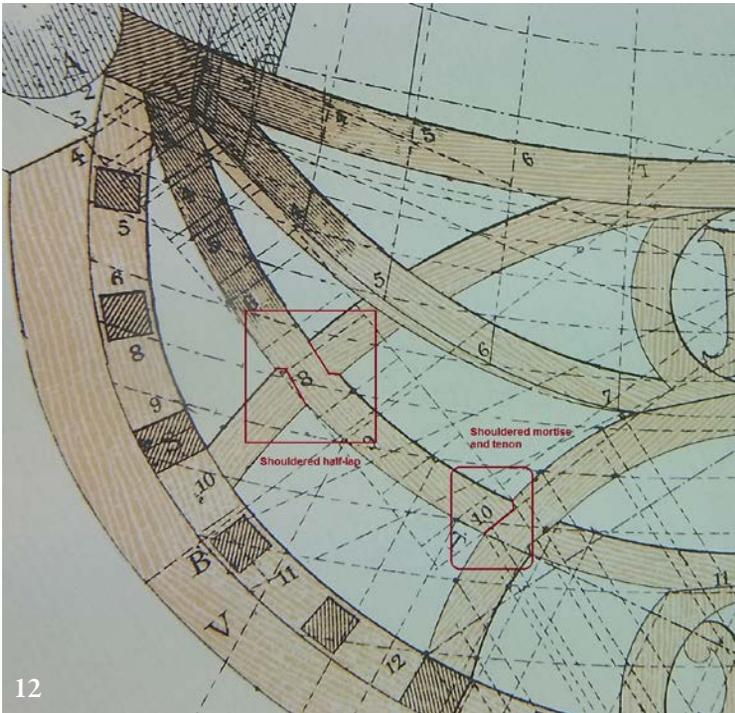
Stereotomy, as applied by French compagnon carpenters, is commonly referred to as *l'art du trait*. This term, roughly translated as “the art of the line,” was first used by Les Compagnons du Devoir, an ancient French craft guild system with possible origins predating the 12th century. German carpenters, *Zimmermänner*, refer to the knowledge and practice of stereotomy as *Schiften*. *Miyadaiku*, the Japanese temple carpenters, refer to it as *kikujutu*. As an art and collection of techniques, stereotomy reflects empirical knowledge that has developed into a genuine intellectual discipline. As it cultivates independent problem solving, stereotomy is relevant and practical on any worksite.

For eight centuries, l'art du trait has been used in France to determine and express, through precise working drawings, the real values of details in a structure. By using this method, a carpenter can determine all the dimensions and angles required, prior to assembly, or even layout, of any components. This can be accomplished through using full-size working drawings, often lofted on the floor, or scaled-down drawings. Such a stereotomical working drawing is commonly referred to as an *épure* (see Figs. 4, 5, and 9).

In *The Artisans and Guilds of France*, François Icher sums up the experience of l'art du trait very well: “For centuries, youngsters on the Tour de France have been initiated into the mysteries of the trait in courses given by journeyman professors who are past masters of its subtleties. In fact, the working drawings used in realizing great ‘masterpieces’ of carpentry are just as remarkable as the artifacts themselves. . . . The trait transforms the work as well as the worker. With the support and supervision of his professor, the student thinks, reflects, and learns to envision differently.”

—PATRICK MOORE

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12 The shoulders of both the half lap and tenon are diminished toward both vertical faces of the component, keying the shoulders into their housings. This detail greatly improves the long-term stability of these joints.

13 The relationship between plan and elevation views of the guitarde's pincer link, including the location where it is mortised to join an infill component. The shoulders of this mortise and tenon joint are plain, in contrast to the diminished shoulders in the previous example. In the elevation, the shoulder area is shaded on either side of the mortise, though there is no housing in the pincer link.



Adam Miller

14 Guitardes welcoming diners to the compagnons' restaurant in Paris, Aux Arts et Sciences Réunis, and an attached museum, featuring numerous grand masterpieces.



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