Applying Classical Proportions

A tea table built to 18th-century rules

by Mack S. Headley, Jr.

After sixteen years of restoring, reproducing and studying 18th-century furniture, I have joined the ranks of those who are convinced that the traditional artisan relied on a geometric proportioning system, based on the five classical orders. As a design exercise to test how the system might have been applied, I built the small table shown here.

Evidence of the system's use is widespread, but vague. Chippendale, quoted below, dearly stated that knowledge of the five orders was basic to the cabinetmaker's art. Some furniture historians insist that Chippendale was exaggerating, but Marcus Wiffen's observations about the character of Virginia buildings, also quoted below, agree with Chippendale. Many 18th- and early 19th-century design books also feature the classical orders, but, like Chippendale, don't tell exactly how the rules were used in designing furniture. This seems to have been privileged information, imparted during apprenticeship. In earlier times, I suspect it was one of the guarded secrets of the furnituremaking and architectural guilds.

I found that the only path toward understanding how the system was used was to go back to the pieces themselves. Surviving examples of period furniture have a great diversity of character, varying with the time and place they were built, the current style (and how it was evolving), and the environment in which they would be placed. To unravel the complexity, I decided to concentrate on the design work of one man, Peter Scott, a Williamsburg, Va., cabinetmaker from 1722 to 1776. Thanks to Wallace Gusler, curator of furniture at Colonial Williamsburg, I was able to study numerous pieces in the collection. Scott's lifetime production is impressive, and filled with subtle variation, control and flair. Yet all his proportions are derived from the five orders: Tuscan, Doric, Ionic, Corinthian and Composite. Upon scale drawings of many of his pieces I have walked with my dividers for hours, discovering geometric relationships which encompass the whole piece—from its major negative and positive spaces to its actual structural elements, moldings and ornaments.

The origins of this design system reach back at least to the Greeks, from whom the Romans borrowed it. And it later served European craftsmen from the Renaissance to the beginning of the Industrial Age. The earliest surviving writings come from the first century AD, *The Ten Books of Architecture* by Vitruvius. He explains that the proportional relationships used in architecture were derived by "the ancients" from the relationships observed in living things. Leonardo

Of all the arts which are either improved or ornamented by architecture, that of cabinet-making is not only the most useful and ornamental, but capable of receiving as great assistance from it as any whatever.. . . Without an acquaintance with [the five orders], and some knowledge of the rules of perspective, the cabinet-maker cannot make the designs of his work intelligible, nor show, in a little compass, the whole conduct and effect of the piece. These, therefore, ought to be carefully studied by everyone who would excel in this branch, since they are the very soul and basis of his art.

—Thomas Chippendale, *The Gentleman &Cabinet-Maker's Director,* 1762

We need not be surprised if we find a high degree of standardization in the design of the eighteenth-century houses of Williamsburg, or of Virginia. The eighteenth century was an age that built according to the rules—the rules handed down in the shops of the various crafts, and the rules set down in the books on architecture. (Which is not to say that the two categories did not overlap, for shop rules were the staple of the authors of many handbooks, and book rules doubtless became the rote-learned formulae of the shops.) But the rules were felt to provide a discipline, not a straitjacket; and always the final appeal, in any disputed question of design, was to the eye.

—Marcus Wiffen, *The Eighteenth-Century Houses of Williamsburg,* 1960

This walnut tea table isn't a reproduction, but a new design that conforms to classical rules of proportion.

John Westerveldt

Fig. 1: Proportions of the Ionic order

In each classical order, the sizes of the pedestal, entablature and column are derived by proportioning the height. The largest diameter of the shaft is called a module, and is divided into sixty minutes, which are then used for scaling moldings. According to Chippendale, good furniture design depends on similar rules.

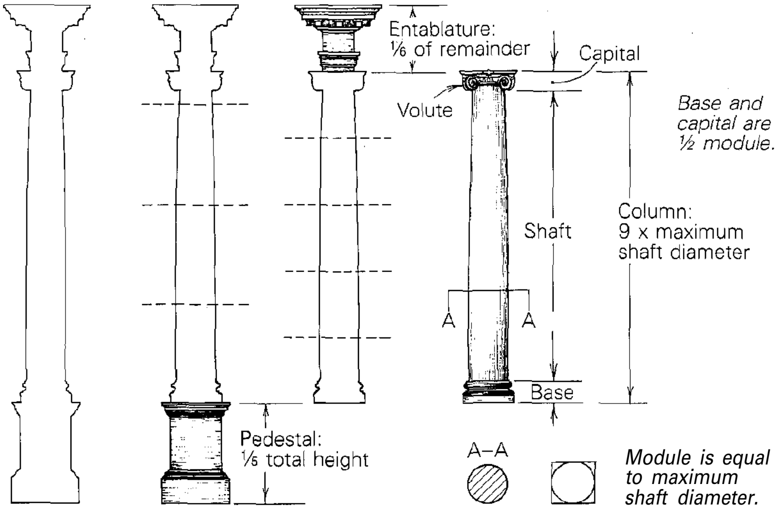
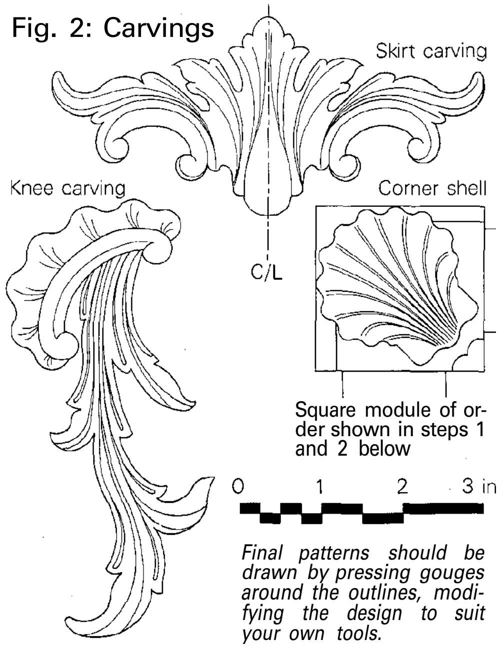
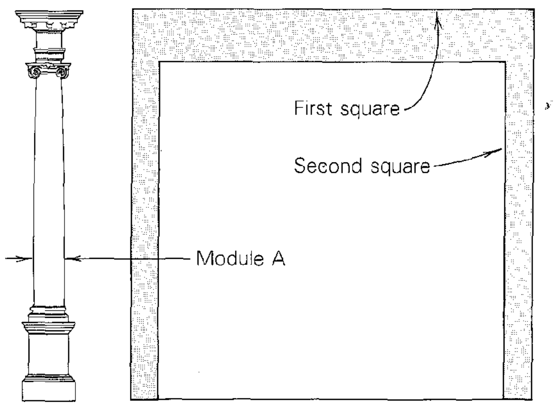


Fig. 2: Carvings



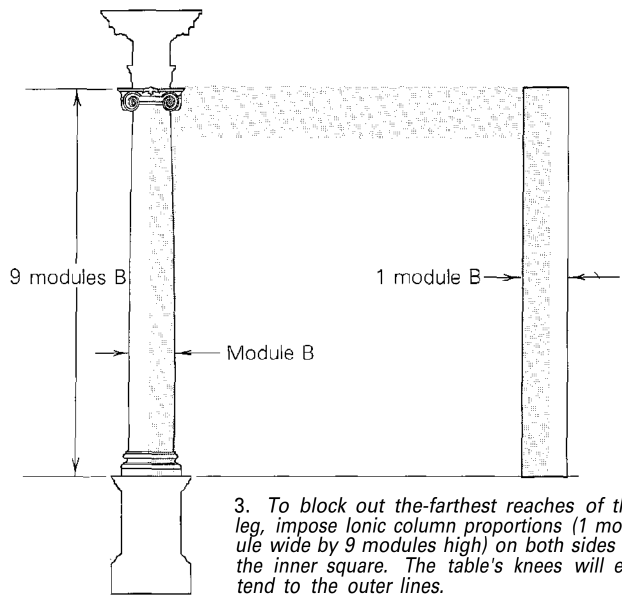
Final patterns should be drawn by pressing gouges around the outlines, modifying the design to suit your own tools.

Fig. 3: Deriving the table's proportions

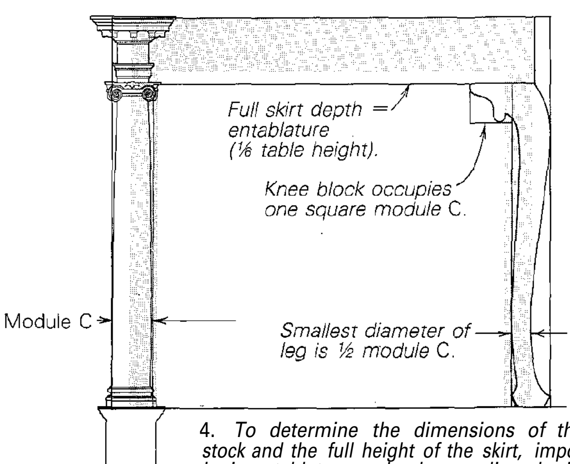


1. *Begin with a square the height of the table.*

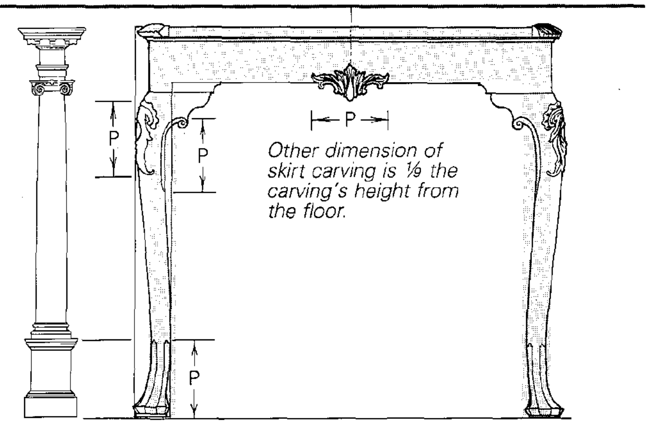
2. *At this height, impose a full Ionic order and draw a second square the height of the entablature. These two squares will define the major positive and negative spaces of the table. Maximum diameter of this column is module* A.



3. *To block out the-farthest reaches of the leg, impose Ionic column proportions (1 module wide by 9 modules high) on both sides of the inner square. The table's knees will extend to the outer lines.*



4. *To determine the dimensions of the leg stock and the full height of the skirt, impose an Ionic entablature and column, aligned with the outside line from step* 3. *The leg's major movement will occur within the width of the column.*



5. *Using the same column as in steps* 1 *and* 2, *the height of the pedestal* (P) *determines the lengths of the stocking on the foot, the knee carving and the volute along the back of the leg, and the width of the skirt carving. Corner posts are set back ⅓ module* C, *knee carving is ¼ module* C *below skirt.*

da Vinci's famous drawing of a spread-eagled man contained within a circle is based on instructions found in Vitruvius, who enumerates other ideal proportions as well. Actual human proportions conform to the ideal more or less for any particular person. By representing the variations, the classical orders portray character from the most masculine, Doric and Tuscan, to the most feminine, Corinthian and Composite. In antiquity, the order chosen for a particular temple or building depended on the character of the god it memorialized, or upon the building's intended use. Vitruvius attempted to codify the ancient proportions, but, as in people, the numbers are not absolute—the rules are guides to be followed with taste and discretion, not scientific formulas.

In each of the five orders, the rules for constructing a column with its pedestal and entablature are based on what its height will be. Figure 1 illustrates the basic directions Chippendale gave for the Ionic order. Similar procedures apply to the other orders as well. In every case, for each part, including the curves of the moldings, a rule is derived from what has gone before. In furniture, the rules appear to be less rigid. Relationships may be based on one of the columns alone or, as I chose for my table, on an order's proportions in various combinations of pedestal, column and entablature.

My plan at the outset was to build a small walnut tea table of moderate decoration. A number of pieces in Williamsburg were influenced by Oriental design. I liked this quality, and suggested it in the shape of the top molding. Many tea tables have knee blocks that run the width of the skirt, from leg to leg. Instead, I applied a small central carving. In addition, I had found a lovely three-million-year-old fossilized shell across the James River from Williamsburg, and decided to add its shape as a block at the corners, to soften them. The carvings on the knee, top and skirt (figure 2) called for something on the foot, so I designed a light stocking. In spite of so many personal design choices, which make the table unlike any single example in the Williamsburg collection, it is, because it was built using the same design vocabulary and the same family of relationships, still something like them all.

The system works whether you apply geometry or numerical measurements. In one surviving piece, Peter Scott used geometry. He drew lines directly on the back of the lower case to proportion the upper section, dividing the back into sixths and projecting diagonals. As an aid to visualizing how my table grew from Ionic proportions, figure 3 shows both the basic square I started with and the three particular sets of proportions I used to determine the actual shape of the table. Instead of a square, I could have begun with a rectangle that was a square-and-a-quarter, a square-and-a-half, or another such simple combination. In end view, for example, the table is twice as high as it is wide, or two squares high. When actually working out the design myself, I found it most convenient to use a calculator to determine the mathematical value of the geometric relationships. I roughly approximated the sizes I wanted the parts to be, then calculated exact sizes by means of Ionic proportions and laid these sizes out on scale drawings. If a part then looked too small, I chose the next larger Ionic relationship and used that instead.

The joinery is simple mortise-and-tenon. The mortises begin ½ in. below the top of the legs to preserve the strength of the upper post. The ends of the tenons are mitered and do not touch each other in the mortise. The ¾-in. long tenons on the top molding fit into the shell blocks, and the molding is grooved to accept the top, which can expand and contract with changes in humidity. The knee blocks are glued in place. The central leaf-element was carved and applied to the skirt, and its projection backed up with secondary wood.

As do the more sophisticated 18th-century examples, the table has an animalistic stance with continuous curves in its legs—no flat, straight spots. Continuous curves are essential to avoid dead spots on legs and carvings. To tune the sculptural curves at knees and ankles, I used my larger, broad-sweep gouges. Sets of carving tools are designed around spiraling curves so that they can be used in various combinations, to control the movement of the spirals and S-curves both in overall sculpturing and in detailing. The larger the variety of gouges, the more control a carver has over the potential movement in a piece. The last master of the original shop in Williamsburg had 94 carving chisels and gouges. Not all would be needed for this table. For the details, you can modify the patterns shown in figure 2 so that they conform to your set of tools. Choose gouges that come close to matching the outline, stamp your pattern according to their curves, and transfer it to the work.

Acquiring experience within this system has been tedious, with lots of new terminology and concepts to understand and integrate. At times I have felt restrained and at other times stretched by where I am being led. But like learning any new language, fluency comes and expression becomes subtler. I no longer feel restricted by it, and in my small shop where diversity of production is important to me, I find that executing a new design is faster, and that the system is an invaluable tool in achieving effective traditional form.

There is another advantage, perhaps more important to the historian than to the furnituremaker. Once the particular classical order to which a piece belongs is understood, its dimensions scale out very close (say, to ⅛ in.) to the hypothetical ideal. The system therefore is helpful in interpreting possible distortions in photographs, as well as aiding in the regeneration of missing parts in restoration work. And despite the freedom of choice enjoyed by the designer, there is more to the modular system than mere coincidence—many outright fake antiques and many modern pieces made "in the style of" can be spotted after just a few measurements have been taken: the system simply isn't there. □

Mack Headley, Jr., makes furniture in Winchester, Va. In search of period furniture makers, Fine Woodworking *visited his and other shops in issue #23.*

Further reading

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