

# TIMBER FRAMING

JOURNAL OF THE TIMBER FRAMERS GUILD  
NUMBER 110 DECEMBER 2013

## CONTENTS

BOOKS: Geometric Design Laurie Smith	2
LETTERS Joseph D. Conwill, Jan Lewandoski, Katie Hill	4
THE BERNESE BAUERNHAUS David Bahler	5
TOWARD EFFECTIVE CLIENT RELATIONS Craig Bridgman	10
ENGINEERED TIMBER CONNECTORS Max Closen	12
NORWEGIAN GRINDBYGG CONSTRUCTION Peter Henrikson	14
GERMAN CODE PROVISIONS FOR MORTISES AND TENONS LOADED IN SHEAR Ben Brungraber, PhD, PE, and Annette Dey, MS, PE	20

*On the front and back covers, a grindbygg-framed barn clad in juniper branches on a farm north of Bergen, Norway. Heavy slates pegged to lower parts of walls protect against splash. Photos Peter Henrikson. Story page 14.*

Copyright © 2013 Timber Framers Guild  
PO Box 60, BECKET, MA 01223  
413-623-8759 www.tfguild.org

### Editorial Correspondence

PO Box 275, Newbury, VT 05051  
802-866-5684 journal@tfguild.org

### Editor

Kenneth Rower

### Contributing Editors

History Jan Lewandoski, Jack A. Sobon  
Engineering Ben Brungraber

Printed on Galerie Art Silk, a 10 percent recycled paper. ♻️

TIMBER FRAMING (ISSN 1061-9860) is published quarterly by the Timber Framers Guild, PO Box 60, Becket, Massachusetts. 01223. Subscription \$35 annually or by membership in the Guild. Periodicals postage paid at Alstead, NH, and additional mailing offices. POSTMASTER: Send address changes to Timber Framers Guild, PO Box 60, Becket, MA 01223.

TIMBER FRAMING, Journal of the Timber Framers Guild, appears in March, June, September and December. The journal is written by its readers and pays for interesting articles by experienced and novice writers alike.



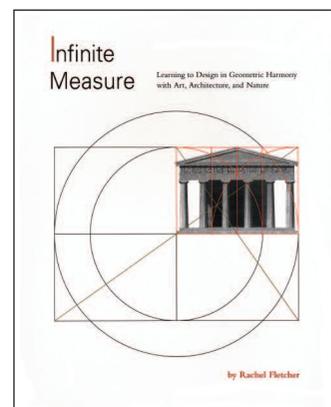
1 9 8 5



## Geometric Design

*Infinite Measure: Learning to Design in Geometric Harmony with Art, Architecture, and Nature*, by Rachel Fletcher. Staunton, Virginia, George F. Thompson Publishing, 2013. 8 3/16 x 10 in., 400 pp., profusely illustrated. ISBN 978-1-938086-02-01. Hardcover, \$45.00.

RACHEL FLETCHER'S new publication, *Infinite Measure*, is a wide-ranging book that defines geometry's presence in the natural world, tracks the history and evolution of geometry from before the classical period through to the present day and presents a comprehensive and impressive body of knowledge simultaneously philosophical and practical. It explains the grammar of geometrical construction, from the initial simplicity and unity of the circle, through gradually more complex constructions that lead ultimately to sophisticated geometrical overlays defining proportional relationships in the natural and built environments. The emphasis throughout is on proportion and how the individual elements of a design should relate to one other, and to the whole, in a proportionate and visually harmonious way. It is impossible in a few words to do full justice to the book so the aim here is to give a general sense of its character and content.



First things first. The cover is white, the lettering black, the initial *I* of *Infinite Measure* and the author's name illuminated in red ocher. The cover illustration, drawn in black, red ocher and gold line, presents two parallel circles proportioned by the side and diagonal of a square constructed on the inner circle's radius. Extending the square to the outer circle generates a  $\sqrt{2}$  rectangle. The rectangle, in turn, forms the proportional boundary of the eastern facade of the Doric Temple of Theseus, built in Athens ca. 450 BC. The book therefore begins in Greece where geometry began. The cover cards are folded to give the book protection where the pages open, the upper and lower edges are precision guillotined, the spine is bound square and the book has a precise visual character in harmony with its subject matter. The book's 400 pages are gratifyingly substantial in the hand.

The black and red ocher color scheme of the cover is maintained throughout the book, giving the work a sustained sense of order and clarity. The pages, as one would expect, are laid out to a geometrical formula (shown on pages 233–35), the single page geometry mirror-imaged, like a butterfly's wings, on facing pages. The formula generates narrow margins where the pages meet and wide margins, for additional notes and quotes, at their outer edges, with the text and geometrical developments filling the space between, a format similar to the classic Van de Graaf layout derived from medieval books, in which the text block has the same proportion

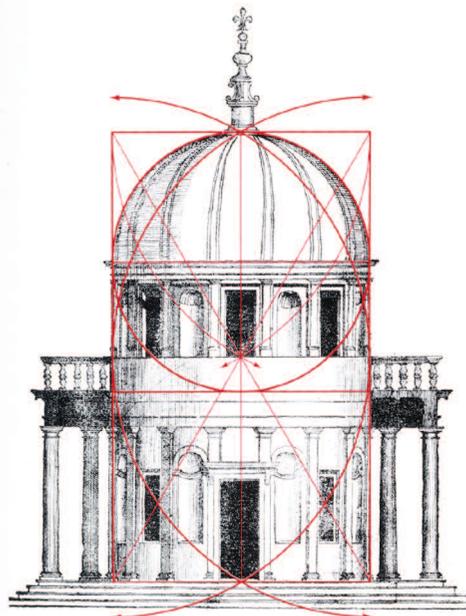
as the page. On the page the constructions are drawn with precision, their fine black lines perfectly defining the intricacy of the geometrical relationships. Crucial alignments are emphasized in thicker, red other lines and the letters that indicate specific elements of the construction are carefully placed. Footnotes give the etymon and meaning of words used in the text above them. This is an instantly intelligible and visually satisfying format that is in perfect accord with the book's raison d'être, the comprehension of proportion necessary, as Rachel Fletcher's introduction states, "... to provide designers with geometric techniques for composing spaces harmonically."

The book is structured in two approximately equal parts, titled *Geometry's Shapes and Symbols* and *Composing Space Plans*. Inevitably, there are elements of overlap, but these act as links between the two parts. The first part begins with the circle and follows the track of spatial logic so that two overlaid circles generate the *vesica piscis* and the vesica generates triangulation, etc. The second part takes up dynamic symmetry and the rectangular ratios arising from the square roots of 2, 3 and 5. Specific drawing instructions for the geometries are given precisely in bold type alongside red other bullet points. Occasional quotes appear in the outer margins in red other italics: Ralph Waldo Emerson's *The eye is the first circle; the horizon which it forms is the second; and throughout nature this primary figure is repeated without end*, and Wassily Kandinsky's *To harmonize the whole is the task of art*, emphasize the author's philosophical stance.

The book stresses the intricate and intrinsic harmonies of geometrical proportion. The incommensurable ratios, which are found in human and other life forms but do not resolve to whole number dimensions, define those elements of space that have perfect geometrical harmony but far from perfect numerical equivalents. For example, the perfect geometrical relationship between a circle's diameter and circumference yields the incommensurable numerical ratio of 1:3.14159265359 that extends ad infinitum. While the geometrical proportions have visual clarity, their decimalization is decidedly confusing.

Geometrical examples developed from the Six-Plus-One Circles generate the well-known daisy wheel and relate it, on a scriptural scale, to the construction of the world in six days with a seventh day of rest and, on the visible scale, to the six radials of a snowflake's form. Linking the daisy wheel's petals on the circle's circumference generates a hexagon. *Hexagon* is printed in bold type in the text and translated from the Greek *hexagōnon* at the foot of the page. Further constructions show patterns of spiraling triangulations, diminishing in scale as they follow the daisy wheel's arcs toward its central axis and then an overlay of the daisy wheel's internal triangulation on the wings of a giant swallowtail butterfly (*Papilio cresphontes*). There is a caveat here in the text, that the subtleties of natural form never conform to idealized geometries precisely, but the overlay demonstrates that natural forms often have a close affinity to pure geometries.

The Square and Tetractys follow. It is a revelation of geometry's intricacy and intimacy that many of the constructions within the square and the tetractys (a pyramidal triangle composed of 10 dots in the format 4-3-2-1 from base to apex) are formed either entirely or partially by compass geometry. The Platonic or Five Regular Solids are next: the dodecahedron, icosahedron, octahedron, tetrahedron and cube, all angular multifaceted three-dimensional forms



TEMPIETTO ELEVATION, WITH OVERLAY.

I-10b

Overlay drawing from *Infinite Measure*

that, counterintuitively, fit exactly within the encompassing globe of a perfect sphere.

Both parts of the book present architectural analyses of classical and modern buildings. For example, an elevation of Donato Bramante's Tempietto, built in Rome circa 1500 as a small martyr temple to Saint Peter, is proportioned through the harmonic fusion of compass and square geometry, as seen at left: the upper half of a circle inscribed in a square defining the dome, the lower half of the square defining the dome's vertical drum. A vertical vesica piscis defines the full height of the building from ground level to the dome's apex and the floor plan occupies a five-circle geometry, the central circle of which defines the interior space. Conversely, Philip Johnson's Glass House (built at New Canaan, Connecticut, in 1949) expresses spatial relationships through approximate use of the Fibonacci series. Fibonacci, born about 1175 at Pisa in Italy, calculated a numerical series, 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, and so on, tabulating the reproductive multiplication of rabbits, a series also found in the number of radiating petals in flower heads. Johnson's Glass House features 3 and 13 in its vertical plane and 8, 8, 5, 8, 8 and 21, 8, 5, 8, 21 in its horizontal planes, the overlapping framework forming a grid of harmonically related rectangles shown by the author's red other overlays.

Other examples show geometrical analyses of the sound box of a Stradivarius violin, a Moroccan tile panel, the south rose window of Notre Dame in Paris, a carpet page from the Lindisfarne Gospels and the natural form of a snow iris. The Pythagorean theorem, the vesica piscis, fundamentals of dynamic symmetry, spirals, the Golden Section, Golden Triangle,  $\sqrt{2}$ ,  $\sqrt{3}$  and  $\sqrt{5}$  rectangles, ad quadratum, the pentagon and octagon, Le Corbusier's Modulor—all are here. Some aspects of geometry are missing, the compass geometry of Romanesque architecture for example, but the omissions are balanced, for this reader, by new revelations. The book concludes with the usual references and index, notes about the essayist who wrote about the author, about the author herself and about the book itself, but by this stage we are on the last page, having undergone a comprehensive geometrical journey under enlightened guidance. This is an impressive book that presents extensive scholarship in a completely reader-friendly way.

Writing this review for *Timber Framing*, some inevitable questions arise. Are timber frames present in the analysis? The answer is no. Does the book show geometrical constructions that a carpenter could lift off the page and use on the framing floor? The answer is again no. So, in the light of these negatives, do the geometrical constructions shown serve any purpose for a carpenter? The answer is yes, because the book introduces the carpenter to the crucial concept of proportion, and control of proportion is a vital tool in the carpenter's kit. While a saw or chisel won't bring good proportions to a frame, geometry will. It follows that, like saw and chisel, geometrical knowledge must be made sharp and kept sharp so that the eye and therefore the mind gain an ever-growing understanding of proportion. Gradually, over time, guesswork will metamorphose into sound aesthetic timber framing judgment.

—LAURIE SMITH  
Laurie Smith ([lauriesmith@uku.co.uk](mailto:lauriesmith@uku.co.uk)) is an artist and graphic designer living in Devon, UK, who has made a specialty of geometric building analysis. His "Useful Geometries for Carpenters" appeared in TF 95 and is collected in *Timber Framing Fundamentals*.