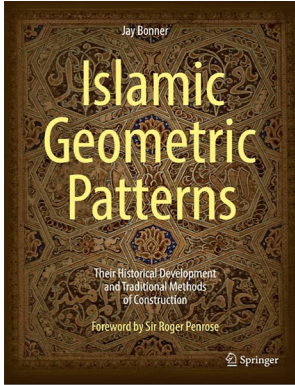




BOOKSHELF

New and noteworthy titles on our bookshelf
January 2019



Islamic Geometric Patterns: Their Historical Developments and Traditional Methods of Construction

by Jay Bonner, with a Foreword by Roger Penrose (Springer, 2017, 595 pages).

Islamic artwork is renowned for its intricate and awe-inspiring use of complex geometric patterns. As Roger Penrose states in the foreword, “there is a distinctive beauty in these

designs, most of these patterns being of a particular geometrical character, demonstrating a keen and subtle knowledge and interest in geometry and a profound skill in using geometrical motifs to produce some incredibly intricate patterns.”

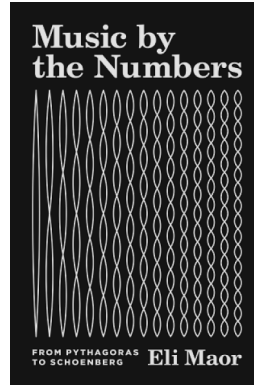
This monumental work contains a staggering 540 figures, almost all of which are in color. *Islamic Geometric Patterns* could certainly function as a “mathematics coffee-table book” since one cannot help browsing through its pages to ponder the many colorful designs carefully described therein.

The book is divided into four major sections. The first chapter, which is approximately 150 pages long, concerns the historical development of the art form. It features many full-color photographs of the original artwork. In the second portion (about seventy pages), the author provides a geometric classification of the mind-boggling array of patterns featured throughout the Islamic world. The third and longest chapter (over three hundred pages) describes the geometrical techniques that underpin the art form. Everything here is explained in great detail, and one feels that motivated readers might even be able to (with great patience and practice) generate such patterns on their own. The final chapter, written by computer scientist Craig Kaplan, is the shortest (a little over twenty pages). It focuses on computer algorithms for the production of geometric patterns of the type described in the book.

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Music by the Numbers: from Pythagoras to Schoenberg

by Eli Maor (Princeton, 2018, 176 pages).

This book concerns the long-running relationship between math and music. It should be appealing to any mathematically oriented reader with some background in music. Familiarity with musical terminology and notation would be a plus.

The first chapter sets the stage and provides a whirlwind tour of physics, mathematics, and western music at the dawn of the twentieth century. The second chapter reaches back to the Pythagoreans and the problem of the vibrating string. From this point the approach is largely chronological, except for five “Sidebars” that are between two and four pages each. These concern related topics, such as using a Slinky to provide a slow-motion model for the vibrating string.

The math involved is not deep and should be accessible to an attentive calculus student. On the other hand, the treatment of music requires a degree of familiarity. For example, the mathematical approaches to composition embraced by Bach and Schoenberg can be explained in words, but only the ear can truly understand the difference.

The reader should be aware that the music discussed belongs almost exclusively to the western tradition. More specifically, the book concerns not only old favorites such as Bach, Beethoven, and Mozart, but also more modern composers, such as Bernstein, Cage, and Schoenberg. Schoenberg’s mathematical approach to atonal composition plays a central role in the later chapters.

The discussion touches on physics early and often. Sometimes the link is direct, such as the study of the vibrating string and the development of Fourier series. At other points, the connections are more abstract. For example, Einstein’s theory of relativity is discussed in parallel with Schoenberg’s development of twelve-tone music. Einstein’s theory tells us that there is no universal, privileged frame of reference. As opposed to most Western music, Schoenberg’s approach is more “relativistic,” in the sense that all twelve tones are utilized with somewhat equal importance.