Jay Kappraff

*Connections: The Geometric Bridge
between Art and Science*

(2nd edition; Singapore: World Scientific, 2002).

Reviewed by Slavik Jablan

In 1990, when the first edition of *Connections* was published, it was one of the first books to create a “geometric bridge between art and science.” It brought together in a single volume material from the areas of proportion in architecture, similarity, the golden mean, graphs, tilings with polygons, two-dimensional networks and lattices, polyhedra (Platonic solids, their transformations and space fillings), isometric transformations and symmetries of the plane. It also helped to stimulate the burgeoning interest in the relationship between mathematics and design by creating a “grammar of space”: a common language spanning the subjects of art, architecture, chemistry, biology, engineering, computer graphics, and mathematics. More than 750 illustrations help to make the book engaging to the reader. The book gained recognition by being chosen in 1991 by the National Association of Publishers as the best book in mathematics and science in the Professional and Reference Division.

The beauty of *Connections* lies with the author’s ability to blend theory and practice. Topics which arise in one context are developed later in other forms. For example, the two chapters on tilings present a comprehensive survey of what is known about regular tilings and their duals. However, applications are then given to nonperiodic tilings, origami, quasicrystals, Islamic patterns, zonogons, dirichlet domains, rural market patterns, and Escher tilings. This chapter is preceded by one on graph theory which introduces the combinatorial information needed to develop tiling theory and begins with an introduction to star polygons as they appear in sacred diagrams. The material of these chapters then forms the basis for an understanding of polyhedra seen as three-dimensional tilings, as well as a serious study of symmetry. As a result, the topics are not merely of academic interest, but they are made relevant to the interests of students of art, architecture, music, mathematics, biology and engineering.

The preface to the second edition describes the fundamental changes that have occurred in the field since 1990: the ease of computer visualization; the communication through the Internet; electronic math/art journals (*Nexus Network Journal*, *Visual Mathematics*); new access to software which explores fractals, tessellations, polyhedra, and minimal surfaces; building kits (Zometool Geometry) and other constructive

materials. Five new sections have also been added focusing on star polyhedra and their connection to the snub figures. Some new discoveries of the design scientist, Haresh Lalvani, have been included along with some material on the Buckminsterfullerene.

In the 1990s, after the pioneering contributions of A.L. Loeb to the field of Design Science and the publication of the first edition of *Connections*, more courses in the mathematics of design were developed. Many educators have discovered the satisfaction that can be derived from engaging students in the constructive activity of creating designs based on mathematical principles. Together with the eleven-part series of videotapes *Mathematics of Design* and *Workbook on Mathematics of Design* by the same author, *Connections* can be used as a primary text in math/art courses encouraging students to explore the interface between art and science. For other readers interested in interdisciplinary studies, *Connections* is an invitation to a journey of ideas, constructions and discoveries made by artists, architects, designers, crystallographers, chemists, and structural biologists stimulated by geometrical thinking.

About the Reviewer

Slavik Jablan is the editor-in-chief of the electronic journal *VisMath*
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