

Divided Spheres: Geodesics and the Orderly Subdivision of the Sphere

By Edward S. Popko

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This well-illustrated book?in color throughout?presents a thorough introduction to the mathematics of Buckminster Fuller’s invention of the geodesic dome, which paved the way for a flood of practical applications as diverse as weather forecasting and fish farms. The author explains the principles of spherical design and the three main categories of subdivision based on geometric solids (polyhedra). He illustrates how basic and advanced CAD techniques apply to spherical subdivision and covers modern applications in product design, engineering, science, games, and sports balls.

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Divided Spheres: Geodesics and the Orderly Subdivision of the Sphere By Edward S. Popko Bibliography

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Editorial Review

Review

"… illustrations in the book, nearly all of them computer generated, are very good indeed. … The book contains an extremely detailed metrical treatment of all the regular and Archimedean polyhedra. An important construction is the space tessellating octahedron + tetrahedron which Fuller described as ‘simplest, most powerful structural system in the universe.’ Taking tubes along the edges of the tessellation, he devised and patented a joint to which up to nine tubes could be connected, making a very rigid structure. This is called the ‘octet struss connector’ and receives an entire, beautifully illustrated chapter in the book. … remarkable book … the sheer scale of the book, 509 pages on how to divide up the surface of a sphere, is amazing."
?Peter Giblin, *The Mathematical Gazette*, March 2014

"The text is written for designers, architects and people interesting in constructions of domes based on spherical subdivision. The book is illustrated with many figures and sketches and examples of real-life usage of the constructions developed during (roughly) the past 60 years. Overall, the book is written in a way accessible to a non-expert in mathematics and geometry. … The book could certainly be a good source for inspiration, with many applications, mostly in architecture and other related areas."
?Pavel Chalmoviansky, *Mathematical Reviews*, May 2013

"This well-illustrated book-in color throughout-presents a thorough introduction to the mathematics of Buckminster Fuller's invention of the geodesic dome, which paved the way for a flood of practical applications as diverse as weather forecasting and fish farms. The author explains the principles of spherical design and the three main categories of subdivision based on geometric solids (polyhedra). He illustrates how basic and advanced CAD techniques apply to spherical subdivision and covers modem applications in product design, engineering, science, games, and sports balls."
?*L'ENSEIGNEMENT MATHEMATIQUE*, 2013

"… the ways in which spheres are modified that make them functional and more interesting … [are] the main point[s] of the book. … Implementations of tessellated spheres are used to describe real-world situations, from computer processor grids to fish farming to the surface of golf balls to global climate models. This is a very entertaining section, demonstrating once again how powerful and useful mathematics is. … this book is an existence proof of how complex, interesting and useful properly altered spheres can be."
?Charles Ashbacher, *MAA Reviews*, December 2012

"In support of his primer, Popko provides a glossary of over 300 terms, a bibliography of 385 citations, reference to 28 useful websites, and an index of nine double columned pages. For some readers, these aids will be most useful in accessing and keeping track of the great diversity of ideas and concepts as well as practical and analytical procedures found in this complex and engaging volume. … a broad array of readers will find much of interest and value in this volume whether in terms of mathematics, conceptualization, application, or production."
?Henry W. Castner, *GEOMATICA*, Vol. 66, No. 3, 2012

"I have loved the beauty and symmetry of polyhedra and spherical divisions for many years. My own efforts have been concentrated on making both simple and complex spherical models using classical methods and

simple tools. Dr. Popko’s elegant new book extends both the science and the art of spherical modeling to include Computer-Aided Design and applications, which I would never have imagined when I started down this fascinating and rewarding path.
His lovely illustrations bring the subject to life for all readers, including those who are not drawn to the mathematics. This book demonstrates the scope, beauty and utility of an art and science with roots in antiquity. Spherical subdivision is relevant today and useful for the future. Anyone with an interest in the geometry of spheres, whether a professional engineer, an architect or product designer, a student, a teacher, or simply someone curious about the spectrum of topics to be found in this book, will find it helpful and rewarding."
?Magnus Wenninger, Benedictine Monk and Polyhedral Modeler

"Edward Popko’s **Divided Spheres** is the definitive source for the many varied ways a sphere can be divided and subdivided. From domes and pollen grains to golf balls, every category and type is elegantly described in these pages. The mathematics and the images together amount to a marvelous collection, one of those rare works that will be on the bookshelf of anyone with an interest in the wonders of geometry."
?Kenneth Snelson, Sculptor and Photographer

"Edward Popko’s **Divided Spheres** is a ‘thesaurus’ must to those whose academic interest in the world of geometry looks to greater coverage of synonyms and antonyms of this beautiful shape we call a sphere. The late Buckminster Fuller might well place this manuscript as an all-reference for illumination to one of nature’s most perfect invention."
?Thomas T.K. Zung, Senior Partner, Buckminster Fuller, Sadao & Zung Architects

"My own discovery, Waterman Polyhedra, was my way to see hidden patterns in ordered points in space. Ed's book **Divided Spheres** is about patterns and points too but on spheres. He shows you how to solve practical design problems based spherical polyhedra. Novices and experts will understand the challenges and classic techniques of spherical design just by looking at the many beautiful illustrations."
?Steve Waterman, Mathematician

"Ed Popko’s comprehensive survey of the history, literature, geometric and mathematical properties of the sphere is the definitive work on the subject. His masterful and thorough investigation of every aspect is covered with sensitivity and intelligence. This book should be in the library of anyone interested in the orderly subdivision of the sphere."
?Shoji Sadao, Architect, Cartographer, and Lifelong Business Partner of Buckminster Fuller

"Any math collection concerned with spherical modeling will find this offers a basic yet complex introduction … blends art with scientific inquiry, providing a college-level coverage of geometry that will bring math alive for any who want a discussion of sphere science."
?Midwest Book Review

Users Review

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Patricia Meyer:

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