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KEY=POLYHEDRON - EMILIE KOLE

Polyhedron Models

Cambridge University Press An explicit guide to the geometric principles, design, and construction of complex polyhedral figures

Dual Models

Cambridge University Press An enthusiastic presentation of the complex set of uniform duals of uniform polyhedral shapes.

Polyhedra

Cambridge University Press This book comprehensively documents the many and varied ways that polyhedra have come to the fore throughout the development of mathematics.

Polyhedron Models for the Classroom

Spherical Models

CUP Archive Well-illustrated, practical approach to creating star-faced spherical forms that can serve as basic structures for geodesic domes. Complete instructions for making models from circular bands of paper with just a ruler and compass. 1979 edition.

The Fifty-Nine Icosahedra

Springer Science & Business Media The Fifty-Nine Icosahedra was originally published in 1938 as No. 6 of "University of Toronto Studies (Mathematical Series)". Of the four authors, only Coxeter and myself are still alive, and we two are the authors of the whole text of the book, in which any signs of immaturity may perhaps be regarded leniently on noting that both of us were still in our twenties when it was written. N either of the others was a professional mathematician. Flather died about 1950, and Petrie, tragically, in a road accident in 1972. Petrie's part in the book consisted in the extremely difficult drawings which consti tute the left half of each of the plates (the much simpler ones on the right being mine). A brief biographical note on Petrie will be found on p. 32 of Coxeter's Regular Polytopes (3rd. ed. , Dover, New York, 1973); and it may be added that he was still a schoolboy when he discovered the regular skew polygons that are named after him, and are the occasion for the note on him in Coxeter's book. (Coxeter also was a schoolboy when some of the results for which he will be most remembered were obtained; he and Petrie were schoolboy friends and used to work together on polyhedron and polytope theory.) Flather's part in the book consisted in making a very beautiful set of miniature models of all the fifty-nine figures. These are still in existence, and in excellent preservation.

Multimodular Origami Polyhedra

Archimedeans, Buckyballs and Duality

Courier Corporation Explore the link between paperfolding and mathematics with this unique, well-illustrated guide to creating a world of multifaceted wonders that draws on elements of crystallography. Detailed instructions, clear diagrams.

Divided Spheres

Geodesics and the Orderly Subdivision of the Sphere

CRC Press Praise for the previous edition [. . .] 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. [. . .] 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 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 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 inventions. – Thomas T. K. Zung, Senior Partner, Buckminster Fuller, Sadao, & Zung Architects. This first edition of this well-illustrated book presented 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 explained the principles of spherical design and the three classic methods of subdivision based on geometric solids (polyhedra). This thoroughly edited new edition does all that, while also introducing new techniques that extend the class concept by relaxing the triangulation constraint to develop two new forms of optimized hexagonal tessellations. The objective is to generate spherical grids where all edge (or arc) lengths or overlap ratios are equal. New to the Second Edition New Foreword by Joseph Clinton, lifelong Buckminster Fuller collaborator A new chapter by Chris Kitrick on the mathematical techniques for developing optimal single-edge hexagonal tessellations, of varying density, with the smallest edge possible for a particular topology, suggesting ways of comparing their levels of optimization An expanded history of the evolution of spherical subdivision New applications of spherical design in science, product design, architecture, and entertainment New geodesic algorithms for grid optimization New full-color spherical illustrations created using DisplaySphere to aid readers in visualizing and comparing the various tessellations presented in the book Updated Bibliography with references to the most recent advancements in spherical subdivision methods

Divided Spheres

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Spherical Models

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The Ethereal Aether

A History of the Michelson-Morley-Miller Aether-drift Experiments, 1880-1930

University of Texas Press The Ethereal Aether is a historical narrative of one of the great experiments in modern physical science. The fame of the 1887 Michelson-Morley aether-drift test on the relative motion of the earth and the luminiferous aether derives largely from the role it is popularly supposed to have played in the origins, and later in the justification, of Albert Einstein's first theory of relativity; its importance is its own. As a case history of the intermittent performance of an experiment in physical optics from 1880 to 1930 and of the men whose work it was, this study describes chronologically the conception, experimental design, first trials, repetitions, influence on physical theory, and eventual climax of the optical experiment. Michelson, Morley, and their colleague Miller were the prime actors in this half-century drama of confrontation between experimental and theoretical physics. The issue concerned the relative motion of "Spaceship Earth" and the Universe, as measured against the background of a luminiferous medium supposedly filling all interstellar space. At stake, it seemed, were the phenomena of astronomical aberration, the wave theory of light, and the Newtonian concepts of absolute space and time. James Clerk Maxwell's suggestion for a test of his electromagnetic theory was translated by Michelson into an experimental design in 1881, redesigned and reaffirmed as a null result with Morley in 1887, thereafter modified and partially repeated by Morley and Miller, finally completed in 1926 by Miller alone, then by Michelson's team again in the late 1920s. Meanwhile Helmholtz, Kelvin, Rayleigh, FitzGerald, Lodge, Larmor, Lorentz, and Poincaré—most of the great names in theoretical physics at the turn of the twentieth century—had wrestled with the anomaly presented by Michelson's experiment. As the relativity and quantum theories matured, wave-particle duality was accepted by a new generation of physicists. The aether-drift tests disproved the old and verified the new theories of light and electromagnetism. By 1930 they seemed to explain Einstein, relativity, and space-time. But in historical fact, the aether died only with its believers.

Geometry II

Springer Science & Business Media This is the second of a two-volume textbook that provides a very readable and lively presentation of large parts of geometry in the classical sense. For each topic the author presents a theorem that is esthetically pleasing and easily stated, although the proof may be quite hard and concealed. Yet another strong trait of the book is that it provides a comprehensive and unified reference source for the field of geometry in the full breadth of its subfields and ramifications.

Origami 5

Fifth International Meeting of Origami Science, Mathematics, and Education

CRC Press Origami5 continues in the excellent tradition of its four previous incarnations, documenting work presented at an extraordinary series of meetings that explored the connections between origami, mathematics, science, technology, education, and other academic fields. The fifth such meeting, 5OSME (July 13–17, 2010, Singapore Management University) followed the precedent previous meetings to explore the interdisciplinary connections between origami and the real world. This book begins with a section on origami history, art, and design. It is followed by sections on origami in education and origami science, engineering, and technology, and culminates with a section on origami mathematics—the pairing that inspired the original meeting. Within this one volume, you will find a broad selection of historical information, artists' descriptions of their processes, various perspectives and approaches to the use of origami in education, mathematical tools for origami design, applications of folding in engineering and technology, as well as original and cutting-edge research on the mathematical underpinnings of origami.

The Basics of Crystallography and Diffraction

Oxford University Press, USA Crystallography and diffraction are widely used throughout many branches of science for studying structure. However, many students find these subjects abstruse and difficult. The aim of this book is to show, through relevant examples and without relying on complex mathematics, that the basic ideas behind crystallography and diffraction are simple and easily comprehensible. It is written by an experienced teacher with the needs of the student to the fore.

Geometric Puzzle Design

CRC Press This book discusses how to design "good" geometric puzzles: two-dimensional dissection puzzles, polyhedral dissections, and burrs. It outlines major categories of geometric puzzles and provides examples, sometimes going into the history and philosophy of those examples. The author presents challenges and thoughtful questions, as well as practical d

Shaping Space

Exploring Polyhedra in Nature, Art, and the Geometrical Imagination

Springer Science & Business Media This second edition is based off of the very popular Shaping Space: A Polyhedral Approach, first published twenty years ago. The book is expanded and updated to include new developments, including the revolutions in visualization and model-making that the computer has wrought. Shaping Space is an exuberant, richly-illustrated, interdisciplinary guide to three-dimensional forms, focusing on the suprisingly diverse world of polyhedra. Geometry comes alive in Shaping Space, as a remarkable range of geometric ideas is explored and its centrality in our cultre is persuasively demonstrated. The book is addressed to designers, artists, architects, engineers, chemists, computer scientists, mathematicians, bioscientists, crystallographers, earth scientists, and teachers at all levels—in short, to all scholars and educators interested in, and working with, two- and three-dimensinal structures and patterns.

College Geometry

Jones & Bartlett Learning College Geometry is divided into two parts. Part I is a sequel to basic high school geometry and introduces the reader to some of the important modern extensions of elementary geometry- extension that have largely entered into the mainstream of mathematics. Part II treats notions of geometric structure that arose with the non-Euclidean revolution in the first half of the nineteenth century.

Negative Space

Trajectories of Sculpture in the 20th and 21st Centuries

MIT Press A bold new spatial perspective on modern sculpture, with 800 color images of work by artists including Henry Moore, Lygia Clark, Anish Kapoor, and Ana Mendieta. This monumental, richly illustrated volume from ZKM | Karlsruhe approaches modern sculpture from a spatial perspective, interpreting it though contour, emptiness, and levitation rather than the conventional categories of unbroken volume, mass, and gravity. It examines works by dozens of twentieth- and twenty-first-century artists, including Hans Arp, Marcel Duchamp, Henry Moore, Barbara Hepworth, Lygia Clark, Anish Kapoor, Olafur Eliasson, Ana Mendieta, Fujiko Nakaya, Tomás Saraceno, and Alicja Kwade. The large-scale book contains over 800 color images. Negative Space comes out of an epic exhibition at ZKM, and volume editor Peter Weibel (Chairman and CEO of ZKM) takes a curatorial approach to the topic. The last exhibition to deal comprehensively with the question "What is modern sculpture?" was at the Centre Georges Pompidou in 1986. Weibel and ZKM pick up where the Pompidou left off, examining sculptures not as figurative, solid, and self-contained monoliths but in terms of open and hollow spaces; reflection, light, shadow; innovative materials; data; and the moving image. Weibel puts advances in science, architecture, and mathematics in the context of avant-garde sensibilities to show how modern sculpture significantly deviates from the work of the past. Texts in the volume include an introduction and twelve chapters written by Weibel with contributions by cocurators as well as facsimiles and

reproductions of artist-authored manifestos.

Hands on History

A Resource for Teaching Mathematics

MAA Research shows that students learn best when they actively participate in their learning. In particular, hands-on activities provide the greatest opportunities for gaining understanding and promoting retention. Apart from simple manipulatives, the mathematics classroom offers few options for hands-on activities. However, the history of mathematics offers many ways to incorporate hands-on learning. By bringing this material culture of mathematics into the classroom, students can experience historical applications and uses of mathematics in a setting rich in discovery and intellectual interest. This volume is a compilation of articles from researchers and educators who use the history of mathematics to facilitate active learning in the classroom. The contributions range from simple devices, such as the rectangular protractor, to elaborate models of descriptive geometry. Other chapters provide detailed descriptions on how to build and use historical models in the high school or collegiate classroom.

Space Structures

Springer Science & Business Media xiv aggregates: this touches on the very nature of things. The concept of statistical symmetry which Loeb develops is particularly important, it emphasizes the limitations in seemingly random aggregates and for permits general statements of which the crystallographer's sym metries are only special cases. The reductionist and holistic approaches to the world have been at war with each other since the times of the Greek philosophers and before. In nature, parts clearly do fit together into real structures, and the parts are affected by their environment. The problem is one of understanding. The mystery that remains lies largely in the nature of structural hierarchy, for the human mind can examine nature on many different scales sequentially but not simultaneously. Arthur Loeb's monograph is a fundamental one, but one can sense a devel opment from the relations between his zero-and three-dimensional cells to the far more complex world of organisms and concepts. It is structure that makes the difference between a cornfield and a cake, between an aggregate of cells and a human being, between a random group of human beings and a society. We can perceive anything only when we perceive its structure, and we think by structural analogy and comparison. Several books have been published showing the beauty of form in nature. This one has the beauty of a work of art, but it grows out of rigorous mathematics and from the simplest of bases-dimensional ity, extent and valency.

Visual Modeling with Logo

A Structured Approach to Seeing

Mit Press Filled with striking illustrations, this book offers an exciting exploration of Logo graphics for designers, architects, liberal arts students, and other individuals who are interested in creative applications of computers.Visual Modeling with Logo introduces the programming concepts necessary for describing and manipulating some of the basic visual structures in the world around us. Logo is a language that encourages visual problem-solving and helps us expand our understanding of how we see.The book provides a wide range of exercises for investigating the many dimensions and component parts of seeing; it proceeds from the simple to the complex, using representative models based on circular grids, rectangular grids, Islamic designs, organic forms, and different spatial systems.James Clayson is an Associate Professor at the American College in Paris. He wrote Visual Modeling with Logo for a course he created at the Parsons School of Design, Paris. It is included in the series Explorations in Logo, edited by E. Paul Goldenberg.

Polyhedra

A Visual Approach

Univ of California Press

Beyond the Cube

The Architecture of Space Frames and Polyhedra

John Wiley & Sons This book offers an in-depth look at space frame architecture, including space frame projects completed by such notable architects as I. M. Pei, Buckminster Fuller, Philip Johnson and Louis Kahn. Both theory and practice are included to offer a comprehensive overview of the history, current use, and future outlook for creating space frame structures. The 15 distinguised contributors to this book have extensive background in the architecture of space frames and offer an international perspective on the subject. The text is illustrated with hundreds of line drawings, black-and-white photos, and an eight-page color insert.

The Historical Roots of Elementary Mathematics

Courier Corporation Exciting, hands-on approach to understanding fundamental underpinnings of modern arithmetic, algebra, geometry and number systems examines their origins in early Egyptian, Babylonian, and Greek sources.

Wheels, Life and Other Mathematical Amusements

American Mathematical Soc. Martin Gardner's Mathematical Games columns in Scientific American inspired and entertained several generations of mathematicians and scientists. Gardner in his crystal-clear prose illuminated corners of mathematics, especially recreational mathematics, that most people had no idea existed. His playful spirit and inquisitive nature invite the reader into an exploration of beautiful mathematical ideas along with him. These columns were both a revelation and a gift when he wrote them; no one--before Gardner--had written about mathematics like this. They continue to be a marvel. This is the original 1983 edition and contains columns published from 1970-1972. It includes three columns on the game of Life.

Reshaping College Mathematics

A Project of the Committee on the Undergraduate Program in Mathematics

Mathematical Assn of Amer

Geometry I

Springer Science & Business Media Volume I of this 2-volume textbook provides a lively and readable presentation of large parts of classical geometry. For each topic the author presents an esthetically pleasing and easily stated theorem - although the proof may be difficult and concealed. The mathematical text is illustrated with figures, open problems and references to modern literature, providing a unified reference to geometry in the full breadth of its subfields and ramifications.

Unsolved Problems in Geometry

New York : Springer-Verlag For mathematicians or others who wish to keep up to date with the state of the art of geometrical problems, this collection of problems that are easy to state and understand but are as yet unsolved covers a wide variety of topics including convex sets, polyhedra, packing and covering, tiling, and combinatorial problems. Annotation copyrighted by Book News, Inc., Portland, OR.

Geometry and Symmetry

John Wiley & Sons This new book helps students gain an appreciation of geometry and its importance in the history and development of mathematics. The material is presented in three parts. The first is devoted to Euclidean geometry. The second covers non-Euclidean geometry. The last part explores symmetry. Exercises and activities are interwoven with the text to enable them to explore geometry. The activities take advantage of geometric software so they'll gain a better understanding of its capabilities. Mathematics teachers will be able to use this material to create exciting and engaging projects in the classroom.

Regular Complex Polytopes

Cambridge University Press The properties of regular solids exercise a fascination which often appeals strongly to the mathematically inclined, whether they are professionals, students or amateurs. In this classic book Professor Coxeter explores these properties in easy stages, introducing the reader to complex polyhedra (a beautiful generalization of regular solids derived from complex numbers) and unexpected relationships with concepts from various branches of mathematics: magic squares, frieze patterns, kaleidoscopes, Cayley diagrams, Clifford surfaces, crystallographic and non-crystallographic groups, kinematics, spherical trigonometry, and algebraic geometry. In the latter half of the book, these preliminary ideas are put together to describe a natural generalization of the Five Platonic Solids. This updated second edition contains a new chapter on Almost Regular Polytopes, with beautiful 'abstract art' drawings. New exercises and discussions have been added throughout the book, including an introduction to Hopf fibration and real representations for two complex polyhedra.

The Geometric Vein

The Coxeter Festschrift

Springer Science & Business Media Geometry has been defined as that part of mathematics which makes appeal to the sense of sight; but this definition is thrown in doubt by the existence of great geometers who were blind or nearly so, such as Leonhard Euler. Sometimes it seems that geometric methods in analysis, so-called, consist in having recourse to notions outside those apparently relevant, so that geometry must be the joining of unlike strands; but then what shall we say of the importance of axiomatic programmes in geometry, where reference to notions outside a restricted reper tory is banned? Whatever its definition, geometry clearly has been more than the sum of its results, more than the consequences of some few axiom sets. It has been a major current in mathematics, with a distinctive approach and a distinc ti v e spirit. A current, furthermore, which has not been constant. In the 1930s, after a period of pervasive prominence, it appeared to be in decline, even passe. These same years were those in which H. S. M. Coxeter was beginning his scientific work. Undeterred by the unfashionability of geometry, Coxeter pursued it with devotion and inspiration. By the 1950s he appeared to the broader mathematical world as a consummate practitioner of a peculiar, out-of-the-way art. Today there is no longer anything that out-of-the-way about it. Coxeter has contributed to, exemplified, we could almost say presided over an unanticipated and dra matic revival of geometry.

Geometry and the Visual Arts

Courier Corporation This survey traces the effects of geometry on artistic achievement and clearly discusses its importance to artists and scientists. It also surveys projective geometry, mathematical curves, theories of perspective, architectural form, and concepts of space.

Mathematical Adventures for Students and Amateurs

American Mathematical Soc.

Counting on Frameworks

Mathematics to Aid the Design of Rigid Structures

Cambridge University Press Book developing a mathematical theory of rigidity, for undergraduates working in modelling or graph theory.

Symmetry

New Scientist

New Scientist magazine was launched in 1956 "for all those men and women who are interested in scientific discovery, and in its industrial, commercial and social consequences". The brand's mission is no different today - for its consumers, New Scientist reports, explores and interprets the results of human endeavour set in the context of society and culture.

Symmetry, Shape and Space

An Introduction to Mathematics Through Geometry

Springer Science & Business Media This book will appeal to at least three groups of readers: prospective high school teachers, liberal arts students, and parents whose children are studying high school or college math. It is modern in its selection of topics, and in the learning models used by the authors. The book covers some exciting but non-traditional topics from the subject area of geometry. It is also intended for undergraduates and tries to engage their interest in mathematics. Many innovative pedagogical modes are used throughout.

Geometrical Deduction of Semiregular from Regular Polytopes and Space Fillings

Dissections

Plane and Fancy

Cambridge University Press A comprehensive, beautifully illustrated survey accessible to anyone familiar with high school geometry.

Fractal Modelling

Growth and Form in Biology

Springer Science & Business Media In this book, methods from fractal geometry are applied to model growth forms, taking as a case study a type of growth process which can be found among various taxonomic classes such as sponges and corals. These models can be used, for example, to understand the amazing variety of forms to be found in a coral reef and to simulate their growth with 2D and 3D geometrical objects. Models which mimic the growth of forms and the environmental influence on the growth process are also useful for ecologists, as a combination of simulation models together with the actual growth forms can be used to detect the effects of slow changes in the environment.