

# Mirrors And Reflections The Geometry Of Finite Reflection Groups

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The Coxeter Legacy Harold Scott Macdonald Coxeter This collection of essays on the legacy of mathematician Donald Coxeter is a mixture of surveys, updates, history, storytelling and personal memories covering both applied and abstract maths. Subjects include: polytopes, Coxeter groups, equivelar polyhedra, Ceva's theorem, and Coxeter and the artists.

Mathematics Under the Microscope Alexandre Borovik 2010 The author's goal is to start a dialogue between mathematicians and cognitive scientists. He discusses, from a working mathematician's point of view, the mystery of mathematical intuition: why are certain mathematical concepts more intuitive than others? To what extent does the "small scale" structure of mathematical concepts and algorithms reflect the workings of the human brain? What are the "elementary particles" of mathematics that build up the mathematical universe? The book is saturated with amusing examples from a wide range of disciplines--from turbulence to error-correcting codes to logic--as well as with just puzzles and brainteasers. Despite the very serious subject matter, the author's approach is lighthearted and entertaining. This is an unusual and unusually fascinating book. Readers who never thought about mathematics after their school years will be amazed to discover how many habits of mind, ideas, and even material objects that are inherently mathematical serve as building blocks of our civilization and everyday life. A professional mathematician, reluctantly breaking the daily routine, or pondering on some resisting problem, will open this book and enjoy a sudden return to his or her young days when mathematics was fresh, exciting, and holding all promises. And do not take the word "microscope" in the title too literally: in fact, the author looks around, in time and space, focusing in turn on a tremendous variety of motives, from mathematical "memes" (genes of culture) to an unusual life of a Hollywood star. --Yuri I. Manin, Max-Planck Institute of Mathematics, Bonn, and Northwestern University

Systolic Geometry and Topology Mikhail Gersh Katz 2007 The systole of a compact metric space  $X$  is a metric invariant of  $X$ , defined as the least length of a noncontractible loop in  $X$ . When  $X$  is a graph, the invariant is usually referred to as the girth, ever since the 1947 article by W. Tutte. The first nontrivial results for systoles of surfaces are the two classical inequalities of C. Loewner and P. Pu, relying on integral-geometric identities, in the case of the two-dimensional torus and real projective plane, respectively. Currently, systolic geometry is a rapidly developing field, which studies systolic invariants in their relation to other geometric invariants of a manifold. This book presents the systolic geometry of manifolds and polyhedra, starting with the two classical inequalities, and then proceeding to recent results, including a proof of M. Gromov's filling area conjecture in a hyperelliptic setting. It then presents Gromov's inequalities and their generalisations, as well as asymptotic phenomena for systoles of surfaces of large genus, revealing a link both to ergodic theory and to properties of congruence subgroups of arithmetic groups. The author includes results on the systolic manifestations of Massey products, as well as of the classical Lusternik-Schnirelmann category.

Mirrors and Reflections Alexandre V. Borovik 2009-11-07 This graduate/advanced undergraduate textbook contains a systematic and elementary treatment of finite groups generated by reflections. The approach is based on fundamental geometric considerations in Coxeter complexes, and emphasizes the intuitive geometric aspects of the theory of reflection groups. Key features include: many important concepts in the proofs are illustrated in simple drawings, which give easy access to the theory; a large number of exercises at various levels of difficulty; some Euclidean geometry is included along with the theory of convex polyhedra; no prerequisites are necessary beyond the basic concepts of linear algebra and group theory; and a good index and bibliography The exposition is directed at advanced undergraduates and first-year graduate students.

Radio Engineering and Electronic Physics 1961

Mathematical Tools for Physicists Michael Grinfeld 2015-01-12 The new edition is significantly updated and expanded. This unique collection of review articles, ranging from fundamental concepts up to latest applications, contains individual contributions written by renowned experts in the relevant fields. Much attention is paid to ensuring fast access to the information, with each carefully reviewed article featuring cross-referencing, references to the most relevant publications in the field, and suggestions for further reading, both introductory as well as more specialized. While the chapters on group theory, integral transforms, Monte Carlo methods, numerical analysis, perturbation theory, and special functions are thoroughly rewritten, completely new content includes sections on commutative algebra, computational algebraic topology, differential geometry, dynamical systems, functional analysis, graph and network theory, PDEs of mathematical physics, probability theory, stochastic differential equations, and variational methods.

On the Shoulders of Giants National Research Council 1990-01-01 What mathematics should be learned by today's young people as well as tomorrow's workforce? On the Shoulders of Giants is a vision of richness of mathematics expressed in essays on change, dimension, quantity, shape, and uncertainty, each of which illustrate fundamental strands for school mathematics. These essays expand on the idea of mathematics as the language and science of patterns, allowing us to realize the importance of providing hands-on experience and the development of a curriculum

that will enable students to apply their knowledge to diverse numerical problems.

**Mathematical Reflections** Peter Hilton 2012-12-06 A relaxed and informal presentation conveying the joy of mathematical discovery and insight. Frequent questions lead readers to see mathematics as an accessible world of thought, where understanding can turn opaque formulae into beautiful and meaningful ideas. The text presents eight topics that illustrate the unity of mathematical thought as well as the diversity of mathematical ideas. Drawn from both "pure" and "applied" mathematics, they include: spirals in nature and in mathematics; the modern topic of fractals and the ancient topic of Fibonacci numbers; Pascals Triangle and paper folding; modular arithmetic and the arithmetic of the infinite. The final chapter presents some ideas about how mathematics should be done, and hence, how it should be taught. Presenting many recent discoveries that lead to interesting open questions, the book can serve as the main text in courses dealing with contemporary mathematical topics or as enrichment for other courses. It can also be read with pleasure by anyone interested in the intellectually intriguing aspects of mathematics.

**Diagram Geometry** Francis Buekenhout 2013-01-26 This book provides a self-contained introduction to diagram geometry. Tight connections with group theory are shown. It treats thin geometries (related to Coxeter groups) and thick buildings from a diagrammatic perspective. Projective and affine geometry are main examples. Polar geometry is motivated by polarities on diagram geometries and the complete classification of those polar geometries whose projective planes are Desarguesian is given. It differs from Tits' comprehensive treatment in that it uses Veldkamp's embeddings. The book intends to be a basic reference for those who study diagram geometry. Group theorists will find examples of the use of diagram geometry. Light on matroid theory is shed from the point of view of geometry with linear diagrams. Those interested in Coxeter groups and those interested in buildings will find brief but self-contained introductions into these topics from the diagrammatic perspective. Graph theorists will find many highly regular graphs. The text is written so graduate students will be able to follow the arguments without needing recourse to further literature. A strong point of the book is the density of examples.

**Geometry II** E.B. Vinberg 2013-04-17 A very clear account of the subject from the viewpoints of elementary geometry, Riemannian geometry and group theory – a book with no rival in the literature. Mostly accessible to first-year students in mathematics, the book also includes very recent results which will be of interest to researchers in this field.

**Geometry Transformed: Euclidean Plane Geometry Based on Rigid Motions** James R. King 2021-04-26 Many paths lead into Euclidean plane geometry. *Geometry Transformed* offers an expeditious yet rigorous route using axioms based on rigid motions and dilations. Since transformations are available at the outset, interesting theorems can be proved sooner; and proofs can be connected to visual and tactile intuition about symmetry and motion. The reader thus gains valuable experience thinking with transformations, a skill that may be useful in other math courses or applications. For students interested in teaching mathematics at the secondary school level, this approach is particularly useful since geometry in the Common Core State Standards is based on rigid motions. The only prerequisite for this book is a basic understanding of functions. Some previous experience with proofs may be helpful, but students can also learn about proofs by experiencing them in this book—in a context where they can draw and experiment. The eleven chapters are organized in a flexible way to suit a variety of curriculum goals. In addition to a geometrical core that includes finite symmetry groups, there are additional topics on circles and on crystallographic and frieze groups, and a final chapter on affine and Cartesian coordinates. The exercises are a mixture of routine problems, experiments, and proofs.

**Reflection Groups and Invariant Theory** Richard Kane 2013-03-09 Reflection groups and invariant theory is a branch of mathematics that lies at the intersection between geometry and algebra. The book contains a deep and elegant theory, evolved from various graduate courses given by the author over the past 10 years.

**Geometry, Topology, and Mathematical Physics** V. M. Buchstaber 2004 This volume contains a selection of papers based on presentations given at the S. P. Novikov seminar held at the Steklov Mathematical Institute in Moscow. Topics and speakers were chosen by the well-known expert, S. P. Novikov, one of the leading mathematicians of the twentieth century. His diverse interests are the tradition of the seminar and are reflected in the topics presented in the book.

**Thinking Algebraically: An Introduction to Abstract Algebra** Thomas Q. Sibley 2021-06-08 *Thinking Algebraically* presents the insights of abstract algebra in a welcoming and accessible way. It succeeds in combining the advantages of rings-first and groups-first approaches while avoiding the disadvantages. After an historical overview, the first chapter studies familiar examples and elementary properties of groups and rings simultaneously to motivate the modern understanding of algebra. The text builds intuition for abstract algebra starting from high school algebra. In addition to the standard number systems, polynomials, vectors, and matrices, the first chapter introduces modular arithmetic and dihedral groups. The second chapter builds on these basic examples and properties, enabling students to learn structural ideas common to rings and groups: isomorphism, homomorphism, and direct product. The third chapter investigates introductory group theory. Later chapters delve more deeply into groups, rings, and fields, including Galois theory, and they also introduce other topics, such as lattices. The exposition is clear and conversational throughout. The book has numerous exercises in each section as well as supplemental exercises and projects for each chapter. Many examples and well over 100 figures provide support for learning. Short biographies introduce the mathematicians who proved many of the results. The book presents a pathway to algebraic thinking in a semester- or year-long algebra course.

**Solid State Physics** 1985-04-23 *Solid State Physics*

**Microwave NDT** N. Ida 2012-12-06 Microwave testing has been paid only scant attention in the literature as a method for nondestructive testing of materials, yet it offers some attractive features, especially for the testing of composite and other non-metallic materials. Microwave techniques have been used in a large number of applications that can be classified as nondestructive testing applications, ranging from large scale remote sensing to detection of tumors in the body. This volume describes a unified approach to microwave nondestructive testing by presenting the three essential components of testing: theory, practice, and modelling. While recognizing that each of these subjects is wide enough to justify a volume of its own, the presentation of the three topics together shows that these are interrelated and should be practiced together. While few will argue against a good theoretical background, modelling and simulation of the testing environment is seldom part of the NDT training in any method, but particularly so in microwave testing. The text is divided in four parts. The first part presents the field theory background necessary for understanding the microwave domain. The second part treats microwave measurements as well as devices and sources and the third part discusses practical tests applicable to a variety of materials and geometries. The fourth part discusses modelling of microwave testing. Each chapter contains a bibliography intended to expand on the material given and, in particular, to point to

subjects which could not be covered either as not appropriate or for lack of space. For engineers, applied physicists, material scientists.

Collected works. 1. Class field theory Pierre Cartier 2004 Mirrors and Reflections presents an intuitive and elementary introduction to finite reflection groups. Starting with basic principles, this book provides a comprehensive classification of the various types of finite reflection groups and describes their underlying geometric properties. Unique to this text is its emphasis on the intuitive geometric aspects of the theory of reflection groups, making the subject more accessible to the novice. Primarily self-contained, necessary geometric concepts are introduced and explained. Principally designed for coursework, this book is saturated with exercises and examples of varying degrees of difficulty. An appendix offers hints for solving the most difficult problems. Wherever possible, concepts are presented with pictures and diagrams intentionally drawn for easy reproduction. Finite reflection groups is a topic of great interest to many pure and applied mathematicians. Often considered a cornerstone of modern algebra and geometry, an understanding of finite reflection groups is of great value to students of pure or applied mathematics. Requiring only a modest knowledge of linear algebra and group theory, this book is intended for teachers and students of mathematics at the advanced undergraduate and graduate levels.

IEE Conference Publication 1974

Controlled Thermonuclear Reactions 1961

TID 1961

Fundamentals of Photonics Bahaa E. A. Saleh 2020-03-04 Fundamentals of Photonics A complete, thoroughly updated, full-color third edition Fundamentals of Photonics, Third Edition is a self-contained and up-to-date introductory-level textbook that thoroughly surveys this rapidly expanding area of engineering and applied physics. Featuring a blend of theory and applications, coverage includes detailed accounts of the primary theories of light, including ray optics, wave optics, electromagnetic optics, and photon optics, as well as the interaction of light and matter. Presented at increasing levels of complexity, preliminary sections build toward more advanced topics, such as Fourier optics and holography, photonic-crystal optics, guided-wave and fiber optics, LEDs and lasers, acousto-optic and electro-optic devices, nonlinear optical devices, ultrafast optics, optical interconnects and switches, and optical fiber communications. The third edition features an entirely new chapter on the optics of metals and plasmonic devices. Each chapter contains highlighted equations, exercises, problems, summaries, and selected reading lists.

Examples of real systems are included to emphasize the concepts governing applications of current interest. Each of the twenty-four chapters of the second edition has been thoroughly updated.

King of Infinite Space Siobhan Roberts 2009-05-26 "There is perhaps no better way to prepare for the scientific breakthroughs of tomorrow than to learn the language of geometry." -Brian Greene, author of *The Elegant Universe* The word "geometry" brings to mind an array of mathematical images: circles, triangles, the Pythagorean Theorem. Yet geometry is so much more than shapes and numbers; indeed, it governs much of our lives-from architecture and microchips to car design, animated movies, the molecules of food, even our own body chemistry. And as Siobhan Roberts elegantly conveys in *The King of Infinite Space*, there can be no better guide to the majesty of geometry than Donald Coxeter, perhaps the greatest geometer of the twentieth century. Many of the greatest names in intellectual history-Pythagoras, Plato, Archimedes, Euclid- were geometers, and their creativity and achievements illuminate those of Coxeter, revealing geometry to be a living, ever-evolving endeavor, an intellectual adventure that has always been a building block of civilization. Coxeter's special contributions-his famed Coxeter groups and Coxeter diagrams-have been called by other mathematicians "tools as essential as numbers themselves," but his greatest achievement was to almost single-handedly preserve the tradition of classical geometry when it was under attack in a mathematical era that valued all things austere and rational. Coxeter also inspired many outside the field of mathematics. Artist M. C. Escher credited Coxeter with triggering his legendary Circle Limit patterns, while futurist/inventor Buckminster Fuller acknowledged that his famed geodesic dome owed much to Coxeter's vision. *The King of Infinite Space* is an elegant portal into the fascinating, arcane world of geometry.

Perspectives on Projective Geometry Jürgen Richter-Gebert 2011-02-04 Projective geometry is one of the most fundamental and at the same time most beautiful branches of geometry. It can be considered the common foundation of many other geometric disciplines like Euclidean geometry, hyperbolic and elliptic geometry or even relativistic space-time geometry. This book offers a comprehensive introduction to this fascinating field and its applications. In particular, it explains how metric concepts may be best understood in projective terms. One of the major themes that appears throughout this book is the beauty of the interplay between geometry, algebra and combinatorics. This book can especially be used as a guide that explains how geometric objects and operations may be most elegantly expressed in algebraic terms, making it a valuable resource for mathematicians, as well as for computer scientists and physicists. The book is based on the author's experience in implementing geometric software and includes hundreds of high-quality illustrations.

Optics Letters 2008

1974 U.R.S.I. Symposium on Electromagnetic Wave Theory, 9-12, July 1974 [held at The] Imperial College of Science and Technology 1974

The Geometry and Topology of Coxeter Groups. (LMS-32) Michael Davis 2012-11-26 *The Geometry and Topology of Coxeter Groups* is a comprehensive and authoritative treatment of Coxeter groups from the viewpoint of geometric group theory. Groups generated by reflections are ubiquitous in mathematics, and there are classical examples of reflection groups in spherical, Euclidean, and hyperbolic geometry. Any Coxeter group can be realized as a group generated by reflection on a certain contractible cell complex, and this complex is the principal subject of this book. The book explains a theorem of Moussong that demonstrates that a polyhedral metric on this cell complex is nonpositively curved, meaning that Coxeter groups are "CAT(0) groups." The book describes the reflection group trick, one of the most potent sources of examples of aspherical manifolds. And the book discusses many important topics in geometric group theory and topology, including Hopf's theory of ends; contractible manifolds and homology spheres; the Poincaré Conjecture; and Gromov's theory of CAT(0) spaces and groups. Finally, the book examines connections between Coxeter groups and some of topology's most famous open problems concerning aspherical manifolds, such as the Euler Characteristic Conjecture and the Borel and Singer conjectures.

Handbook of Discrete and Computational Geometry, Second Edition Csaba D. Toth 2004-04-13 While high-quality books and journals in this field continue to proliferate, none has yet come close to matching the *Handbook of Discrete and Computational Geometry*, which in its first edition, quickly became the definitive reference work in its field. But with the rapid growth of the discipline and the many advances made over the past seven years, it's time to bring this standard-setting reference up to date. Editors Jacob E. Goodman and Joseph O'Rourke reassembled their stellar

panel of contributors, added many more, and together thoroughly revised their work to make the most important results and methods, both classic and cutting-edge, accessible in one convenient volume. Now over more than 1500 pages, the Handbook of Discrete and Computational Geometry, Second Edition once again provides unparalleled, authoritative coverage of theory, methods, and applications. Highlights of the Second Edition: Thirteen new chapters: Five on applications and others on collision detection, nearest neighbors in high-dimensional spaces, curve and surface reconstruction, embeddings of finite metric spaces, polygonal linkages, the discrepancy method, and geometric graph theory Thorough revisions of all remaining chapters Extended coverage of computational geometry software, now comprising two chapters: one on the LEDA and CGAL libraries, the other on additional software Two indices: An Index of Defined Terms and an Index of Cited Authors Greatly expanded bibliographies

Handbook of Discrete and Computational Geometry Csaba D. Toth 2017-11-22 The Handbook of Discrete and Computational Geometry is intended as a reference book fully accessible to nonspecialists as well as specialists, covering all major aspects of both fields. The book offers the most important results and methods in discrete and computational geometry to those who use them in their work, both in the academic world—as researchers in mathematics and computer science—and in the professional world—as practitioners in fields as diverse as operations research, molecular biology, and robotics. Discrete geometry has contributed significantly to the growth of discrete mathematics in recent years. This has been fueled partly by the advent of powerful computers and by the recent explosion of activity in the relatively young field of computational geometry. This synthesis between discrete and computational geometry lies at the heart of this Handbook. A growing list of application fields includes combinatorial optimization, computer-aided design, computer graphics, crystallography, data analysis, error-correcting codes, geographic information systems, motion planning, operations research, pattern recognition, robotics, solid modeling, and tomography.

Use and Redesign in IS: Double Helix Relationships? Hans-Erik Nissen 2007 Nothing provided

Trends in Banach Spaces and Operator Theory Anna Kamińska 2003 This volume contains proceedings of the conference on Trends in Banach Spaces and Operator Theory, which was devoted to recent advances in theories of Banach spaces and linear operators. Included in the volume are 25 papers, some of which are expository, while others present new results. The articles address the following topics: history of the famous James' theorem on reflexivity, projective tensor products, construction of noncommutative  $L_p$ -spaces via interpolation, Banach spaces with abundance of nontrivial operators, Banach spaces with small spaces of operators, convex geometry of Coxeter-invariant polyhedra, uniqueness of unconditional bases in quasi-Banach spaces, dynamics of cohyponormal operators, and Fourier algebras for locally compact groupoids. The book is suitable for graduate students and research mathematicians interested in Banach spaces and operator theory and their applications.

Geometric Methods in Physics Piotr Kielanowski 2013-07-30 The Białowieża workshops on Geometric Methods in Physics, taking place in the unique environment of the Białowieża natural forest in Poland, are among the important meetings in the field. Every year some 80 to 100 participants both from mathematics and physics join to discuss new developments and to interchange ideas. The current volume was produced on the occasion of the XXXI meeting in 2012. For the first time the workshop was followed by a School on Geometry and Physics, which consisted of advanced lectures for graduate students and young researchers. Selected speakers of the workshop were asked to contribute, and additional review articles were added. The selection shows that despite its now long tradition the workshop remains always at the cutting edge of ongoing research. The XXXI workshop had as a special topic the works of the late Boris Vasilievich Fedosov (1938–2011) who is best known for a simple and very natural construction of a deformation quantization for any symplectic manifold, and for his contributions to index theory.?

X-ray and Extreme Ultraviolet Optics Richard B. Hoover 1995

The Complete Idiot's Guide to Geometry Denise Szecsei 2004 Offers an introduction to the principles of geometry, from theorems, proofs, and postulates to lines, angles, and polygons.

Quasicrystals and Discrete Geometry Jiri Patera 1998-01-01

Reflection Groups and Invariant Theory Richard Kane 2001 Reflection groups and invariant theory is a branch of mathematics that lies at the intersection between geometry and algebra. The book contains a deep and elegant theory, evolved from various graduate courses given by the author over the past 10 years.

Groups and Symmetries John P. Harnad

Thermal Radiation Heat Transfer, 5th Edition John R. Howell 2010-09-28 Providing a comprehensive overview of the radiative behavior and properties of materials, the fifth edition of this classic textbook describes the physics of radiative heat transfer, development of relevant analysis methods, and associated mathematical and numerical techniques. Retaining the salient features and fundamental coverage that have made it popular, Thermal Radiation Heat Transfer, Fifth Edition has been carefully streamlined to omit superfluous material, yet enhanced to update information with extensive references. Includes four new chapters on Inverse Methods, Electromagnetic Theory, Scattering and Absorption by Particles, and Near-Field Radiative Transfer Keeping pace with significant developments, this book begins by addressing the radiative properties of blackbody and opaque materials, and how they are predicted using electromagnetic theory and obtained through measurements. It discusses radiative exchange in enclosures without any radiating medium between the surfaces—and where heat conduction is included within the boundaries. The book also covers the radiative properties of gases and addresses energy exchange when gases and other materials interact with radiative energy, as occurs in furnaces. To make this challenging subject matter easily understandable for students, the authors have revised and reorganized this textbook to produce a streamlined, practical learning tool that: Applies the common nomenclature adopted by the major heat transfer journals Consolidates past material, reincorporating much of the previous text into appendices Provides an updated, expanded, and alphabetized collection of references, assembling them in one appendix Offers a helpful list of symbols With worked-out examples, chapter-end homework problems, and other useful learning features, such as concluding remarks and historical notes, this new edition continues its tradition of serving both as a comprehensive textbook for those studying and applying radiative transfer, and as a repository of vital literary references for the serious researcher.

Thermal Radiation Heat Transfer, Fourth Edition Robert Siegel 2001-12-07 This extensively revised 4th edition provides an up-to-date, comprehensive single source of information on the important subjects in engineering radiative heat transfer. It presents the subject in a progressive manner that is excellent for classroom use or self-study, and also provides an annotated reference to literature and research in the field. The foundations and methods for treating radiative heat transfer are developed in detail, and the methods are demonstrated and clarified by

solving example problems. The examples are especially helpful for self-study. The treatment of spectral band properties of gases has been made current and the methods are described in detail and illustrated with examples. The combination of radiation with conduction and/or convection has been given more emphasis and has been merged with results for radiation alone that serve as a limiting case; this increases practicality for energy transfer in translucent solids and fluids. A comprehensive catalog of configuration factors on the CD that is included with each book provides over 290 factors in algebraic or graphical form. Homework problems with answers are given in each chapter, and a detailed and carefully worked solution manual is available for instructors. Geometry Turned On James King 1997-10-30 Articles about the uses of active, exploratory geometry carried out with interactive computer software.

Visual Geometry and Topology Anatolij T. Fomenko 2012-12-06 Geometry and topology are strongly motivated by the visualization of ideal objects that have certain special characteristics. A clear formulation of a specific property or a logically consistent proof of a theorem often comes only after the mathematician has correctly "seen" what is going on. These pictures which are meant to serve as signposts leading to mathematical understanding, frequently also contain a beauty of their own. The principal aim of this book is to narrate, in an accessible and fairly visual language, about some classical and modern achievements of geometry and topology in both intrinsic mathematical problems and applications to mathematical physics. The book starts from classical notions of topology and ends with remarkable new results in Hamiltonian geometry. Fomenko lays special emphasis upon visual explanations of the problems and results and downplays the abstract logical aspects of calculations. As an example, readers can very quickly penetrate into the new theory of topological descriptions of integrable Hamiltonian differential equations. The book includes numerous graphical sheets drawn by the author, which are presented in special sections of "Visual material". These pictures illustrate the mathematical ideas and results contained in the book. Using these pictures, the reader can understand many modern mathematical ideas and methods. Although "Visual Geometry and Topology" is about mathematics, Fomenko has written and illustrated this book so that students and researchers from all the natural sciences and also artists and art students will find something of interest within its pages.