Space And Geometry In The Light Of Physiological Psychological And Physical Inquery

Language, Space and MindGeometryThe Geometry of Space ConsciousnessSpace, Geometry, and Kant's Transcendental Deduction of the CategoriesThe Volume of Convex Bodies and Banach Space GeometrySpace and Geometry in the Light of Physiological and Physical InquirySpace and GeometryGod and GeometryWriting, Geometry and Space in Seventeenth-century England and AmericaKing of Infinite SpaceBeyond GeometryQuantum Mechanics in the Geometry of Space-TimeThe Shape of SpaceThe Shape of Inner SpaceSpacetime, Geometry, CosmologyPhilosophical Problems of Space and TimeElementary Geometry in Hyperbolic SpaceSpace, Geometry, and Kant's Transcendental Deduction of the CategoriesSpace, Time, and GeometrySpace, Geometry and AestheticsSpacetime and GeometrySpace and GeometryA First Course in Differential GeometrySpace and Geometry in the Light of Physiological, Psychological and Physical InquiryArt and GeometryIntroduction to Differential Geometry of Space Curves and SurfacesElementary Geometry in Hyperbolic SpaceProjective GeometrySymmetry, Shape and SpaceThe Geometry of Domains in SpaceA Course in Modern Mathematical PhysicsDesigning Learning Environments for Developing Understanding of Geometry and SpaceGeometric Flows and the

Geometry of Space-timeA Mathematical Space OdysseyAnalytic Geometry of SpaceGeometry in SpaceGeometry of Minkowski Space-TimeA Vector Space Approach to GeometryThe Geometry of Special RelativityGeometry of Time and Space

Language, Space and Mind

A self-contained presentation of results relating the volume of convex bodies and Banach space geometry.

Geometry

The Geometry of Space Consciousness

The series is devoted to the publication of monographs and high-level textbooks in mathematics, mathematical methods and their applications. Apart from covering important areas of current interest, a major aim is to make topics of an interdisciplinary nature accessible to the non-specialist. The works in this series are addressed to advanced students and researchers in mathematics and theoretical physics. In addition, it can serve as a guide for lectures and seminars on a graduate level. The series de Gruyter Studies in Mathematics was founded ca. 35 years ago by the late Professor Heinz Bauer and Professor Peter Gabriel with the aim to establish a series of monographs and textbooks of high standard, written by scholars with an

international reputation presenting current fields of research in pure and applied mathematics. While the editorial board of the Studies has changed with the years, the aspirations of the Studies are unchanged. In times of rapid growth of mathematical knowledge carefully written monographs and textbooks written by experts are needed more than ever, not least to pave the way for the next generation of mathematicians. In this sense the editorial board and the publisher of the Studies are devoted to continue the Studies as a service to the mathematical community. Please submit any book proposals to Niels Jacob. Titles in planning include Flavia Smarazzo and Alberto Tesei, Measure Theory: Radon Measures, Young Measures, and Applications to Parabolic Problems (2019) Elena Cordero and Luigi Rodino, Time-Frequency Analysis of Operators (2019) Mark M. Meerschaert, Alla Sikorskii, and Mohsen Zayernouri, Stochastic and Computational Models for Fractional Calculus, second edition (2020) Mariusz Lemańczyk, Ergodic Theory: Spectral Theory, Joinings, and Their Applications (2020) Marco Abate, Holomorphic Dynamics on Hyperbolic Complex Manifolds (2021) Miroslava Antić, Joeri Van der Veken, and Luc Vrancken, Differential Geometry of Submanifolds: Submanifolds of Almost Complex Spaces and Almost Product Spaces (2021) Kai Liu, Ilpo Laine, and Lianzhong Yang, Complex Differential-Difference Equations (2021) Rajendra Vasant Gurjar, Kayo Masuda, and Masayoshi Miyanishi, Affine Space Fibrations (2022)

Space, Geometry, and Kant's

Transcendental Deduction of the Categories

The articles in this volume have been stimulated in two different ways. More than two years ago the editor of Synthese, laakko Hintikka, an nounced a special issue devoted to space and time, and articles were solicited. Part of the reason for that announcement was also the second source of papers. Several years ago I gave a seminar on special relativity at Stanford, and the papers by Domotor, Harrison, Hudgin, Latzer and myself partially arose out of discussion in that seminar. All of the papers except those of Griinbaum, Fine, the second paper of Friedman, and the paper of Adams appeared in a special double issue of Synthese (24 (1972), Nos. 1-2). I am pleased to have been able to add the four additional papers mentioned in making the special issue a volume in the Synthese Library. Of these four additional articles, only the one by Fine has pre viously appeared in print (Synthese 22 (1971),448--481); its relevance to the present volume is apparent. In preparing the papers for publication and in carrying out the various editorlal chores of such a task, I am very much indebted to Mrs. Lillian O'Toole for her extensive assistance. INTRODUCTION The philosophy of space and time has been of permanent importance in philosophy, and most of the major historical figures in philosophy, such as Aristotle, Descartes and Kant, have had a good deal to say about the nature of space and time.

The Volume of Convex Bodies and

Banach Space Geometry

This volume reflects an appreciation of the interactive roles of subject matter, teacher, student, and technologies in designing classrooms that promote understanding of geometry and space. Although these elements of geometry education are mutually constituted, the book is organized to highlight, first, the editors' vision of a general geometry education; second, the development of student thinking in everyday and classroom contexts; and third, the role of technologies. Rather than looking to high school geometry as the locus--and all too often, the apex--of geometric reasoning, the contributors to this volume suggest that reasoning about space can and should be successfully integrated with other forms of mathematics, starting at the elementary level and continuing through high school. Reintegrating spatial reasoning into the mathematical mainstream--indeed, placing it at the core of K-12 mathematics environments that promote learning with understanding--will mean increased attention to problems in modeling, structure, and design and reinvigoration of traditional topics such as measure, dimension, and form. Further, the editors' position is that the teaching of geometry and spatial visualization in school should not be compressed into a characterization of Greek geometry, but should include attention to contributions to the mathematics of space that developed subsequent to those of the Greeks. This volume is essential reading for those involved in mathematics education at all levels, including university faculty, researchers, and

graduate students.

Space and Geometry in the Light of Physiological and Physical Inquiry

A fascinating exploration of the correlation between geometry and linear algebra, this text portrays the former as a subject better understood by the use and development of the latter rather than as an independent field. The treatment offers elementary explanations of the role of geometry in other branches of math and science — including physics, analysis, and group theory — as well as its value in understanding probability, determinant theory, and function spaces. Outstanding features of this volume include discussions of systematic geometric motivations in vector space theory and matrix theory; the use of the center of mass in geometry, with an introduction to barycentric coordinates; axiomatic development of determinants in a chapter dealing with area and volume; and a careful consideration of the particle problem. Students and other mathematically inclined readers will find that this inquiry into the interplay between geometry and other areas offers an enriched appreciation of both subjects.

Space and Geometry

In section 20 in the B edition 'Deduction', Kant states that his purpose is achieved: to show that all intuitions in general are subject to the categories. The standard reading understands this to mean that all

our representational ideas, including those originating in sense experience, are structured by categories: there are 'no judgments of perception' in the doctrine of the 'First Critique', only judgments of experience. Against this reading the book argues that while all intuitions for Kant are unified intuitions, not all are unified by the categories, thus allowing for judgments of perception.

God and Geometry

This highly stimulating study observes many historical interrelationships between art and mathematics. It explores ancient and Renaissance painting and sculpture, the development of perspective, and advances in projective geometry.

Writing, Geometry and Space in Seventeenth-century England and America

King of Infinite Space

Rethinking the roles played by mathematics and cartography in the 17th century, this book explores the unstable currency of mathematics at the time, and traces it through a wide variety of literary and scientific texts.

Beyond Geometry

The Geometry of Special Relativity provides an

introduction to special relativity that encourages readers to see beyond the formulas to the deeper geometric structure. The text treats the geometry of hyperbolas as the key to understanding special relativity. This approach replaces the ubiquitous γ symbol of most standard treatments with the appropriate hyperbolic trigonometric functions. In most cases, this not only simplifies the appearance of the formulas, but also emphasizes their geometric content in such a way as to make them almost obvious. Furthermore, many important relations, including the famous relativistic addition formula for velocities, follow directly from the appropriate trigonometric addition formulas. The book first describes the basic physics of special relativity to set the stage for the geometric treatment that follows. It then reviews properties of ordinary two-dimensional Euclidean space, expressed in terms of the usual circular trigonometric functions, before presenting a similar treatment of two-dimensional Minkowski space, expressed in terms of hyperbolic trigonometric functions. After covering special relativity again from the geometric point of view, the text discusses standard paradoxes, applications to relativistic mechanics, the relativistic unification of electricity and magnetism, and further steps leading to Einstein's general theory of relativity. The book also briefly describes the further steps leading to Einstein's general theory of relativity and then explores applications of hyperbola geometry to non-Euclidean geometry and calculus, including a geometric construction of the derivatives of trigonometric functions and the exponential function.

Quantum Mechanics in the Geometry of Space-Time

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.

The Shape of Space

The Shape of Inner Space

Solid geometry is the traditional name for what we call today the geometry of three-dimensional Euclidean space. Courses in solid geometry have largely disappeared from American high schools and colleges. The authors are convinced that a mathematical exploration of three-dimensional geometry merits some attention in today's curriculum. A Mathematical Space Odyssey: Solid Geometry in the 21st Century is devoted to presenting techniques for proving a variety of mathematical results in three-dimensional space, techniques that may improve one's ability to think visually. Special attention is given to the classical icons of solid geometry (prisms, pyramids, platonic

solids, cones, cylinders, and spheres) and many new and classical results: Cavalieri's principle, Commandino's theorem, de Gua's theorem, Prince Rupert's cube, the Menger sponge, the Schwarz lantern, Euler's rotation theorem, the Loomis-Whitney inequality, Pythagorean theorems in three dimensions, etc. The authors devote a chapter to each of the following basic techniques for exploring space and proving theorems: enumeration, representation, dissection, plane sections, intersection, iteration, motion, projection, and folding and unfolding. In addition to many figures illustrating theorems and their proofs, a selection of photographs of three-dimensional works of art and architecture are included. Each chapter includes a selection of Challenges for the reader to explore further properties and applications. It concludes with solutions to all the Challenges in the book, references, and a complete index. Readers should be familiar with high school algebra, plane and analytic geometry, and trigonometry. While brief appearances of calculus do occur, no knowledge of calculus is necessary to enjoy this book.

Spacetime, Geometry, Cosmology

Maintaining the standard of excellence set by the previous edition, this textbook covers the basic geometry of two- and three-dimensional spaces Written by a master expositor, leading researcher in the field, and MacArthur Fellow, it includes experiments to determine the true shape of the universe and contains illustrated examples and

engaging exercises that teach mind-expanding ideas in an intuitive and informal way. Bridging the gap from geometry to the latest work in observational cosmology, the book illustrates the connection between geometry and the behavior of the physical universe and explains how radiation remaining from the big bang may reveal the actual shape of the universe.

Philosophical Problems of Space and Time

"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.

Elementary Geometry in Hyperbolic Space

Space, Geometry, and Kant's Transcendental Deduction of the Categories

The series is devoted to the publication of monographs and high-level textbooks in mathematics, mathematical methods and their applications. Apart from covering important areas of current interest, a major aim is to make topics of an interdisciplinary nature accessible to the non-specialist. The works in this series are addressed to advanced students and researchers in mathematics and theoretical physics. In addition, it can serve as a guide for lectures and seminars on a graduate level.

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Masuda, and Masayoshi Miyanishi, Affine Space Fibrations (2022)

Space, Time, and Geometry

A new approach to linguistic meaning and grammatical constructions based on simple geometric principles.

Space, Geometry and Aesthetics

Examining multiple modes of spatio-temporal and geometric figurations of life, the author explores how relationships between space, geometry and aesthetics generate productive expressions of subjectivity, developed through Kant's 'reflective subject' and 'geometric' texts by Plato and others towards Deleuze's philosophy of sense.

Spacetime and Geometry

Novel interpretation of the relationship between space, time, gravitation, and their cosmological implications; based on author's discovery of a value in gravitation overlooked by both Newton and Einstein. 1982 edition.

Space and Geometry

This book continues the fundamental work of Arnold Sommerfeld and David Hestenes formulating theoretical physics in terms of Minkowski space-time geometry. We see how the standard matrix version of

the Dirac equation can be reformulated in terms of a real space-time algebra, thus revealing a geometric meaning for the “number i” in quantum mechanics. Next, it is examined in some detail how electroweak theory can be integrated into the Dirac theory and this way interpreted in terms of space-time geometry. Finally, some implications for quantum electrodynamics are considered. The presentation of real quantum electromagnetism is expressed in an addendum. The book covers both the use of the complex and the real languages and allows the reader acquainted with the first language to make a step by step translation to the second one.

A First Course in Differential Geometry

This comprehensive treatment of domains (in space) emphasizes the growing interaction between analysis and geometry. Geometric analysis, as it is known, is currently an important area of study for both pure and applied mathematicians, physicists, and engineers. Aimed at graduate students of the field, this monograph will be useful in the classroom or as a resource for self-study. The prerequisites are minimal; a good understanding of multivariable calculus and linear algebra will suffice for most purposes.

Space and Geometry in the Light of Physiological, Psychological and Physical Inquiry

Art and Geometry

It is ten years since Adolf Griinbaum published the first edition of this book. It was promptly recognized to be one of the few major works in the philosophy of the natural sciences of this generation. In part, this is so because Griinbaum has chosen a problem basic both to philosophy and to the natural sciences - the nature of space and time; and in part, this is so because he so admirably exemplifies that Aristotelian devotion to the intimate and mutual dependence of actual science and philosophical understanding. More than this, however, the quality of his work derives from his achievement in combining detail with scope. The problems of space and time have been among the most difficult in contemporary and classical thought, and Griinbaum has been responsible to the full depth and complexity of these difficulties. This revised and enlarged second edition is a work in progress, in the tradition of reflective analysis of modern science of such figures as Ehrenfest and Reichenbach. In publishing this work among the Boston Studies in the Philosophy of Science, we hope to contribute to and encourage that broad tradition of natural philosophy which is marked by the close collaboration of philoso phers and scientists. To this end, we have published the proceedings of our Colloquia, of meetings and conferences here and abroad, as well as the works of single authors.

Introduction to Differential Geometry of Space Curves and Surfaces

Elementary Geometry in Hyperbolic

Space

This book provides an original introduction to the geometry of Minkowski space-time. A hundred years after the space-time formulation of special relativity by Hermann Minkowski, it is shown that the kinematical consequences of special relativity are merely a manifestation of space-time geometry. The book is written with the intention of providing students (and teachers) of the first years of University courses with a tool which is easy to be applied and allows the solution of any problem of relativistic kinematics at the same time. The book treats in a rigorous way, but using a non-sophisticated mathematics, the Kinematics of Special Relativity. As an example, the famous "Twin Paradox" is completely solved for all kinds of motions. The novelty of the presentation in this book consists in the extensive use of hyperbolic numbers, the simplest extension of complex numbers, for a complete formalization of the kinematics in the Minkowski space-time. Moreover, from this formalization the understanding of gravity comes as a manifestation of curvature of space-time, suggesting new research fields.

Projective Geometry

Symmetry, Shape and Space

Discusses the history, progress, and applications of topology, and its usefulness to science and society, along with a timeline of notable events.

The Geometry of Domains in Space

A Course in Modern Mathematical Physics

Spacetime and Geometry is an introductory textbook on general relativity, specifically aimed at students. Using a lucid style, Carroll first covers the foundations of the theory and mathematical formalism, providing an approachable introduction to what can often be an intimidating subject. Three major applications of general relativity are then discussed: black holes, perturbation theory and gravitational waves, and cosmology. Students will learn the origin of how spacetime curves (the Einstein equation) and how matter moves through it (the geodesic equation). They will learn what black holes really are, how gravitational waves are generated and detected, and the modern view of the expansion of the universe. A brief introduction to quantum field theory in curved spacetime is also included. A student familiar with this book will be ready to tackle research-level problems in gravitational physics.

Designing Learning Environments for Developing Understanding of Geometry and Space

Presents a survey of the history and evolution of the branch of mathematics labeled geometry, including useful applications and notable mathematicians in this area.

Geometric Flows and the Geometry of Space-time

In section 20 in the B edition 'Deduction', Kant states that his purpose is achieved: to show that all intuitions in general are subject to the categories. The standard reading understands this to mean that all our representational ideas, including those originating in sense experience, are structured by categories: there are 'no judgments of perception' in the doctrine of the 'First Critique', only judgments of experience. Against this reading the book argues that while all intuitions for Kant are unified intuitions, not all are unified by the categories, thus allowing for judgments of perception.

A Mathematical Space Odyssey

Argues that geometry is fundamental to string theory--which posits that we live in a 10-dimensional existence--as well as the very nature of the universe, and explains where mathematics will take string theory next.

Analytic Geometry of Space

This book consists of two lecture notes on geometric flow equations (O. Schnürer) and Lorentzian geometry - holonomy, spinors and Cauchy Problems (H. Baum and T. Leistner) written by leading experts in these fields. It grew out of the summer school “Geometric flows and the geometry of space-time” held in Hamburg (2016) and provides an excellent

introduction for students of mathematics and theoretical physics to important themes of current research in global analysis, differential geometry and mathematical physics

Geometry in Space

Whicher explores the concepts of polarity and movement in modern projective geometry as a discipline of thought that transcends the limited and rigid space and forms of Euclid, and the corresponding material forces conceived in classical mechanics. Rudolf Steiner underlined the importance of projective geometry as "a method of training the imaginative faculties of thinking, so that they become an instrument of cognition no less conscious and exact than mathematical reasoning." This seminal approach allows for precise scientific understanding of the concept of creative fields of formative (etheric) forces at work in nature--in plants, animals and in the human being.

Geometry of Minkowski Space-Time

This book provides an introduction to the mathematics of modern physics, presenting concepts and techniques in mathematical physics at a level suitable for advanced undergraduates and beginning graduate students. It aims to introduce the reader to modern mathematical thinking within a physics setting. Topics covered include tensor algebra, differential geometry, topology, Lie groups and Lie algebras, distribution theory, fundamental analysis

and Hilbert spaces. The book includes exercises and worked examples, to test the students' understanding of the various concepts, as well as extending the themes covered in the main text.

A Vector Space Approach to Geometry

The Geometry of Special Relativity

Many of the earliest books, particularly those dating back to the 1900s and before, are now extremely scarce and increasingly expensive. We are republishing these classic works in affordable, high quality, modern editions, using the original text and artwork.

Geometry of Time and Space

With detailed explanations and numerous examples, this textbook covers the differential geometry of surfaces in Euclidean space.