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KEY=MATHEMATICS - CARTER EWING

THE GEOMETRY OF SPACETIME

AN INTRODUCTION TO SPECIAL AND GENERAL RELATIVITY

Springer Science & Business Media *Hermann Minkowski recast special relativity as essentially a new geometric structure for spacetime. This book looks at the ideas of both Einstein and Minkowski, and then introduces the theory of frames, surfaces and intrinsic geometry, developing the main implications of Einstein's general relativity theory.*

THE GEOMETRY OF MINKOWSKI SPACETIME

AN INTRODUCTION TO THE MATHEMATICS OF THE SPECIAL THEORY OF RELATIVITY

Courier Corporation *This mathematically rigorous treatment examines Zeeman's characterization of the causal automorphisms of Minkowski spacetime and the Penrose theorem concerning the apparent shape of a relativistically moving sphere. Other topics include the construction of a geometric theory of the electromagnetic field; an in-depth introduction to the theory of spinors; and a classification of electromagnetic fields in both tensor and spinor form. Appendixes introduce a topology for Minkowski spacetime and discuss Dirac's famous "Scissors Problem." Appropriate for graduate-level courses, this text presumes only a knowledge of linear algebra and elementary point-set topology. 1992 edition. 43 figures.*

SPACETIME AND GEOMETRY

Cambridge University Press *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.*

SPACETIME

FOUNDATIONS OF GENERAL RELATIVITY AND DIFFERENTIAL GEOMETRY

Springer Science & Business Media *One of the most of exciting aspects is the general relativity pred- tion of black holes and the Such Big Bang. predictions gained weight the theorems through Penrose. singularity pioneered In various by te- books on theorems general relativity singularity are and then presented used to that black holes exist and that the argue universe started with a To date what has big been is bang. a critical of what lacking analysis these theorems predict-’ We of really give a proof a typical singul- theorem and this ity use theorem to illustrate problems arising through the of possibilities violations" and "causality weak "shell very crossing These singularities". add to the problems weight of view that the point theorems alone singularity are not sufficient to the existence of predict physical singularities. The mathematical theme of the book In order to both solid gain a of and intuition understanding good for any mathematical theory, one,should to realise it as model of try a a fam- iar non-mathematical theories have had concept. Physical an especially the important on of and impact development mathematics, conversely various modern theories physical rather require sophisticated mathem- ics for their formulation. both and mathematics Today, physics are so that it is often difficult complex to master the theories in both very s- in the of jects. However, case differential pseudo-Riemannian geometry or the general relativity* *between and mathematics relationship physics is and it is therefore especially close, to from interd- possible profit an ciplinary approach.*

INTRODUCTION TO DIFFERENTIAL GEOMETRY OF SPACE CURVES AND SURFACES

Lulu.com

THE GEOMETRY OF SPECIAL RELATIVITY

CRC Press *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.*

SPACE AND GEOMETRY IN THE LIGHT OF PHYSIOLOGICAL, PSYCHOLOGICAL AND PHYSICAL INQUIRY

Open Court Classics *This historic book may have numerous typos, missing text, images, or index. Purchasers can download a free scanned copy of the original book (without typos) from the publisher. 1906. Not illustrated. Excerpt: ... SPACE AND GEOMETRY FROM THE POINT OF VIEW OF PHYSICAL INQUIRY.1 Our notions of space are rooted in our physiological organism. Geometric concepts are the product of the idealization of physical experiences of space. Systems of geometry, finally, originate in the logical classification of the conceptual materials so obtained. All three factors have left their indubitable traces in modern geometry. Epistemological inquiries regarding space and geometry accordingly concern the physiologist, the psychologist, the physicist, the mathematician, the philosopher, and the logician alike, and they can be gradually carried to their definitive solution only by the consideration of the widely disparate points of view which are here offered. Awakening in early youth to full consciousness, we find ourselves in possession of the notion of a space surrounding and encompassing our body, in which space move divers bodies, now altering and now retaining their size and shape. It is impossible for us to ascertain how this notion has been begotten. Only the most thoroughgoing analysis of experiments purposefully and methodically performed has enabled us to conjecture that inborn idiosyncracies of the body have cooperated to this end with simple and crude experiences of a purely physical character. Sensational And Locative Qualties. An object seen or touched is distinguished not only by a sensational quality (as "red," "rough," "cold," etc.), but also by a locative quality (as "to the left," "above," "before," etc.). The sensational quality may remain the same, while the locative quality continuously changes; that is, the same sensuous object may move in space. Phenomena of this kind being again and again induced by physico-physilogical circumstances, it is found that however ...*

SPACETIME, GEOMETRY AND GRAVITATION

Springer Science & Business Media *This is an introductory book on the general theory of relativity based partly on lectures given to students of M.Sc. Physics at my university. The book is divided into three parts. The ?rst part is a preliminary course on general relativity with minimum preparation. The second part builds the ma- ematical background and the third part deals with topics where mathematics developed in the second part is needed. The ?rst chapter gives a general background and introduction. This is f- lowed by an introduction to curvature through Gauss' Theorema Egregium. This theorem expresses the curvature of a two-dimensional surface in terms of intrinsic quantitiesrelatedtothein?nitesimaldistancefunctiononthesurface.Thestudent isintroducedtothemetrictensor,Christo?elsymbolsandRiemanncurvaturet- sor by elementary methods in the familiar and visualizable case of two dimensions. This early introduction to geometric quantities equips a student to learn simpler topics in general relativity like the Newtonian limit, red shift, the Schwarzschild solution, precession of the perihelion and bending of light in a gravitational ?eld. Part II (chapters 5 to 10) is an introduction to Riemannian geometry as - quired by general relativity. This is done from the beginning, starting with vectors and tensors. I believe that students of physics grasp physical concepts better if they are not shaky about the mathematics involved.*

A VECTOR SPACE APPROACH TO GEOMETRY

Courier Dover Publications *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.*

GENERAL RELATIVITY

University of Chicago Press *"Wald's book is clearly the first textbook on general relativity with a totally modern point of view; and it succeeds very well where others are only partially successful. The book includes full discussions of many problems of current interest which are not treated in any extant book, and all these matters are considered with perception and understanding."—S. Chandrasekhar "A tour de force: lucid, straightforward, mathematically rigorous, exacting in the analysis of the theory in its physical aspect."—L. P. Hughston, Times Higher Education Supplement "Truly excellent. . . . A sophisticated text of manageable size that will probably be read by every student of relativity, astrophysics, and field theory for years to come."—James W. York, Physics Today*

THE GEOMETRY OF PHYSICS

AN INTRODUCTION

Cambridge University Press *This book provides a working knowledge of those parts of exterior differential forms, differential geometry, algebraic and differential topology, Lie groups, vector bundles and Chern forms that are essential for a deeper understanding of both classical and modern physics and engineering. Included are discussions of analytical and fluid dynamics, electromagnetism (in flat and curved space), thermodynamics, the Dirac operator and spinors, and gauge fields, including Yang–Mills, the Aharonov–Bohm effect, Berry phase and instanton winding numbers, quarks and quark model for mesons. Before discussing abstract notions of differential geometry, geometric intuition is developed through a rather extensive introduction to the study of surfaces in ordinary space. The book is ideal for graduate and advanced undergraduate students of physics, engineering or mathematics as a course text or for self study. This third edition includes an overview of Cartan's exterior differential forms, which previews many of the geometric concepts developed in the text.*

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.*

GEOMETRY OF MINKOWSKI SPACE-TIME

Springer Science & Business Media *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.*

INTRODUCTION TO HYPERBOLIC GEOMETRY

Springer Science & Business Media *This book is an introduction to hyperbolic and differential geometry that provides material in the early chapters that can serve as a textbook for a standard upper division course on hyperbolic geometry. For that material, the students need to be familiar with calculus and linear algebra and willing to accept one advanced theorem from analysis without proof. The book goes well beyond the standard course in later chapters, and there is enough material for an honors course, or for supplementary reading. Indeed, parts of the book have been used for both kinds of courses. Even some of what is in the early chapters would surely not be nec essary for a standard course. For example, detailed proofs are given of the Jordan Curve Theorem for Polygons and of the decomposability of poly gons into triangles, These proofs are included for the sake of completeness, but the results themselves are so believable that most students should skip the proofs on a first reading. The axioms used are modern in character and more "user friendly" than the traditional ones. The familiar real number system is used as an in gredient rather than appearing as a result of the axioms. However, it should not be thought that the geometric treatment is in terms of models: this is an axiomatic approach that is just more convenient than the traditional ones.*

DIFFERENTIAL GEOMETRY AND RELATIVITY THEORY

AN INTRODUCTION

Routledge *Differentilil Geometry and Relativity Theory: An Introduction approaches relativity asa geometric theory of space and time in which gravity is a manifestation of space-timecurvature, rathe1 than a force. Uniting differential geometry and both special and generalrelativity in a single source, this easy-to-understand text opens the general theory of relativityto mathematics majors having a backgr.ound only in multivariable calculus and linearalgebra.The book offers a broad overview of the physical foundations and mathematical details ofrelativity, and presents concrete physical interpretations of numerous abstract concepts inRiemannian geometry. The work is profusely illustrated with diagrams aiding in the understandingof proofs and explanations. Appendices feature important material on vectoranalysis and hyperbolic functions.Differential Geometry and Relativity Theory: An Introduction serves as* *the ideal textfor high-level undergraduate couues in mathematics and physics, and includes a solutionsmanual augmenting classroom study. It is an invaluable reference for mathematicians interestedin differential and IUemannian geometry, or the special and general theories ofrelativity*

SPACETIME, GEOMETRY, COSMOLOGY

Courier Dover Publications *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.*

RELATIVITY AND GEOMETRY

FOUNDATIONS AND PHILOSOPHY OF SCIENCE AND TECHNOLOGY SERIES

Elsevier *Relativity and Geometry aims to elucidate the motivation and significance of the changes in physical geometry brought about by Einstein, in both the first and the second phases of relativity. The book contains seven chapters and a mathematical appendix. The first two chapters review a historical background of relativity. Chapter 3 centers on Einstein's first Relativity paper of 1905. Subsequent chapter presents the Minkowskian formulation of special relativity. Chapters 5 and 6 deal with Einstein's search for general relativity from 1907 to 1915, as well as some aspects and subsequent developments of the theory. The last chapter explores the concept of simultaneity, geometric conventionalism, and a few other questions concerning space time structure, causality, and time.*

QUANTUM MECHANICS IN THE GEOMETRY OF SPACE-TIME

ELEMENTARY THEORY

Springer Science & Business Media *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.*

THE GEOMETRY OF DOMAINS IN SPACE

Springer Science & Business Media *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.*

THE GEOMETRY OF SPACETIME

A MATHEMATICAL INTRODUCTION TO RELATIVITY THEORY

Springer *This book systematically develops the mathematical foundations of the theory of relativity and links them to physical relations. For this purpose, differential geometry on manifolds is introduced first, including differentiation and integration, and special relativity is presented as tensor calculus on tangential spaces. Using Einstein's field equations relating curvature to matter, the relativistic effects in the solar system including black holes are discussed in detail. The text is aimed at students of physics and mathematics and assumes only basic knowledge of classical differential and integral calculus and linear algebra.*

INTRODUCTION TO LORENTZ GEOMETRY

CURVES AND SURFACES

CRC Press *Lorentz Geometry is a very important intersection between Mathematics and Physics, being the mathematical language of General Relativity. Learning this type of geometry is the first step in properly understanding questions regarding the structure of the universe, such as: What is the shape of the universe? What is a spacetime? What is the relation between gravity and curvature? Why exactly is time treated in a different manner than other spatial dimensions? Introduction to Lorentz Geometry: Curves and Surfaces intends to provide the reader with the minimum mathematical background needed to pursue these very interesting questions, by presenting the classical theory of curves and surfaces in both Euclidean and Lorentzian ambient spaces simultaneously. Features: Over 300 exercises Suitable for senior undergraduates and graduates studying Mathematics and Physics Written in an accessible style without loss of precision or mathematical rigor Solution manual available on www.routledge.com/9780367468644*

GENERAL RELATIVITY WITHOUT CALCULUS

A CONCISE INTRODUCTION TO THE GEOMETRY OF RELATIVITY

Springer Science & Business Media *“General Relativity Without Calculus” offers a compact but mathematically correct introduction to the general theory of relativity, assuming only a basic knowledge of high school mathematics and physics. Targeted at first year undergraduates (and advanced high school students) who wish to learn Einstein’s theory beyond popular science accounts, it covers the basics of special relativity, Minkowski space-time, non-Euclidean geometry, Newtonian gravity, the Schwarzschild solution, black* *holes and cosmology. The quick-paced style is balanced by over 75 exercises (including full solutions), allowing readers to test and consolidate their understanding.*

GEOMETRY OF QUANTUM STATES

AN INTRODUCTION TO QUANTUM ENTANGLEMENT

Cambridge University Press *Quantum information theory is a branch of science at the frontier of physics, mathematics, and information science, and offers a variety of solutions that are impossible using classical theory. This book provides a detailed introduction to the key concepts used in processing quantum information and reveals that quantum mechanics is a generalisation of classical probability theory. The second edition contains new sections and entirely new chapters: the hot topic of multipartite entanglement; in-depth discussion of the discrete structures in finite dimensional Hilbert space, including unitary operator bases, mutually unbiased bases, symmetric informationally complete generalized measurements, discrete Wigner function, and unitary designs; the Gleason and Kochen–Specker theorems; the proof of the Lieb conjecture; the measure concentration phenomenon; and the Hastings' non-additivity theorem. This richly-illustrated book will be useful to a broad audience of graduates and researchers interested in quantum information theory. Exercises follow each chapter, with hints and answers supplied.*

THE GEOMETRY OF ENVIRONMENT

AN INTRODUCTION TO SPATIAL ORGANIZATION IN DESIGN

Routledge *Originally published in 1971 The Geometry of Environment is a fusion of art and mathematics introducing stimulating ideas from modern geometry, using illustrations from architecture and design. The revolution in the teaching of mathematics and the advent of the computer in design challenge traditional ways of appreciating the space about us, and expand the 'structural' understanding of our surroundings through such concepts as transformations, symmetry groups, sets and graphs. This book aims to show the relevance of 'new maths' and encourages exploration of the widening intellectual horizons of environmental design and architecture.*

SPRINGER HANDBOOK OF SPACETIME

Springer *The Springer Handbook of Spacetime is dedicated to the ground-breaking paradigm shifts embodied in the two relativity theories, and describes in detail the profound reshaping of physical sciences they ushered in. It includes in a single volume chapters on foundations, on the underlying mathematics, on physical and astrophysical implications, experimental evidence and cosmological predictions, as well as chapters on efforts to unify general relativity and quantum physics. The Handbook can be used as a desk reference by researchers in a wide variety of fields, not only by specialists in relativity but also by researchers in related areas that either grew out of, or are deeply influenced by, the two relativity theories: cosmology, astronomy and astrophysics, high energy physics, quantum field theory, mathematics, and philosophy of science. It should also serve as a valuable resource for graduate students and young researchers entering these areas, and for instructors who teach courses on these subjects. The Handbook is divided into six parts. Part A: Introduction to Spacetime Structure. Part B: Foundational Issues. Part C: Spacetime Structure and Mathematics. Part D: Confronting Relativity theories with observations. Part E: General relativity and the universe. Part F: Spacetime beyond Einstein.*

GEOMETRIC FLOWS AND THE GEOMETRY OF SPACE-TIME

Birkhäuser *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*

AN INTRODUCTION TO NONCOMMUTATIVE DIFFERENTIAL GEOMETRY AND ITS PHYSICAL APPLICATIONS

Cambridge University Press *A thoroughly revised introduction to non-commutative geometry.*

BASIC ALGEBRAIC GEOMETRY 2

SCHEMES AND COMPLEX MANIFOLDS

Springer *The second volume of Shafarevich's introductory book on algebraic geometry focuses on schemes, complex algebraic varieties and complex manifolds. As with first volume the author has revised the text and added new material. Although the material is more advanced than in Volume 1 the algebraic apparatus is kept to a minimum making the book accessible to non-specialists. It can be read independently of the first volume and is suitable for beginning graduate students.*

SPACETIME, GEOMETRY AND GRAVITATION

Springer Science & Business Media *This introductory textbook on the general theory of relativity presents a solid foundation for those who want to learn about relativity. The subject is presented in a physically intuitive, but mathematically rigorous style. The topic of relativity is covered in a broad and deep manner. Besides, the aim is that after reading the book a student should not feel discouraged when she opens advanced texts on general relativity for further reading. The book consists of three parts: An introduction to the general theory of relativity. Geometrical mathematical background material. Topics that include the action principle, weak gravitational fields and gravitational waves, Schwarzschild and Kerr solution, and the Friedman equation in cosmology. The book is* *suitable for advanced graduates and graduates, but also for established researchers wishing to be educated about the field.*

VISUAL DIFFERENTIAL GEOMETRY AND FORMS

A MATHEMATICAL DRAMA IN FIVE ACTS

Princeton University Press *An inviting, intuitive, and visual exploration of differential geometry and forms Visual Differential Geometry and Forms fulfills two principal goals. In the first four acts, Tristan Needham puts the geometry back into differential geometry. Using 235 hand-drawn diagrams, Needham deploys Newton's geometrical methods to provide geometrical explanations of the classical results. In the fifth act, he offers the first undergraduate introduction to differential forms that treats advanced topics in an intuitive and geometrical manner. Unique features of the first four acts include: four distinct geometrical proofs of the fundamentally important Global Gauss-Bonnet theorem, providing a stunning link between local geometry and global topology; a simple, geometrical proof of Gauss's famous Theorema Egregium; a complete geometrical treatment of the Riemann curvature tensor of an n-manifold; and a detailed geometrical treatment of Einstein's field equation, describing gravity as curved spacetime (General Relativity), together with its implications for gravitational waves, black holes, and cosmology. The final act elucidates such topics as the unification of all the integral theorems of vector calculus; the elegant reformulation of Maxwell's equations of electromagnetism in terms of 2-forms; de Rham cohomology; differential geometry via Cartan's method of moving frames; and the calculation of the Riemann tensor using curvature 2-forms. Six of the seven chapters of Act V can be read completely independently from the rest of the book. Requiring only basic calculus and geometry, Visual Differential Geometry and Forms provocatively rethinks the way this important area of mathematics should be considered and taught.*

THE GEOMETRY OF TIME

Wiley-VCH *A description of the geometry of space-time with all the questions and issues explained without the need for formulas. As such, the author shows that this is indeed geometry, with actual constructions familiar from Euclidean geometry, and which allow exact demonstrations and proofs. The formal mathematics behind these constructions is provided in the appendices. The result is thus not a textbook introducing readers to the theory of special relativity so they may calculate formally, but rather aims to show the connection with synthetic geometry. It presents the relation to projective geometry and uses this to illustrate the starting points of general relativity. Written at an introductory level for undergraduates, this novel presentation will also benefit teaching staff.*

GEOMETRY WITH AN INTRODUCTION TO COSMIC TOPOLOGY

Jones & Bartlett Learning *The content of Geometry with an Introduction to Cosmic Topology is motivated by questions that have ignited the imagination of stargazers since antiquity. What is the shape of the universe? Does the universe have and edge? Is it infinitely big? Dr. Hitchman aims to clarify this fascinating area of mathematics. This non-Euclidean geometry text is organized intothree natural parts. Chapter 1 provides an overview including a brief history of Geometry, Surfaces, and reasons to study Non-Euclidean Geometry. Chapters 2-7 contain the core mathematical content of the text, following the ErlangenProgram, which develops geometry in terms of a space and a group of transformations on that space. Finally chapters 1 and 8 introduce (chapter 1) and explore (chapter 8) the topic of cosmic topology through the geometry learned in the preceding chapters.*

AN INTRODUCTION TO LIE GROUPS AND THE GEOMETRY OF HOMOGENEOUS SPACES

American Mathematical Soc. *It is remarkable that so much about Lie groups could be packed into this small book. But after reading it, students will be well-prepared to continue with more advanced, graduate-level topics in differential geometry or the theory of Lie groups. The theory of Lie groups involves many areas of mathematics. In this book, Arvanitoyeorgos outlines enough of the prerequisites to get the reader started. He then chooses a path through this rich and diverse theory that aims for an understanding of the geometry of Lie groups and homogeneous spaces. In this way, he avoids the extra detail needed for a thorough discussion of other topics. Lie groups and homogeneous spaces are especially useful to study in geometry, as they provide excellent examples where quantities (such as curvature) are easier to compute. A good understanding of them provides lasting intuition, especially in differential geometry. The book is suitable for advanced undergraduates, graduate students, and research mathematicians interested in differential geometry and neighboring fields, such as topology, harmonic analysis, and mathematical physics.*

TOPICS IN THE GEOMETRY OF PROJECTIVE SPACE

RECENT WORK OF F.L. ZAK

Birkhäuser *The main topics discussed at the D. M. V. Seminar were the connectedness theorems of Fulton and Hansen, linear normality and subvarieties of small codimension in projective spaces. They are closely related; thus the connectedness theorem can be used to prove the inequality-part of Hartshorne's conjecture on linear normality, whereas Deligne's generalisation of the connectedness theorem leads to a refinement of Barth's results on the topology of varieties with small codimension in a projective space. The material concerning the connectedness theorem itself (including the highly surprising application to tamely ramified coverings of the projective plane) can be found in the paper by Fulton and the first author: W. Fulton, R. Lazarsfeld, Connectivity and its applications in algebraic geometry, Lecture Notes in Math. 862, p. 26-92 (Springer 1981). It was never intended to be written out in these notes. As to linear normality, the situation is different. The main point was an exposition of Zak's work, for most of which there is no reference but his letters. Thus it is appropriate to take an extended version of the content of the lectures as the central part of these notes.*

AN INTRODUCTION TO DIFFERENTIAL GEOMETRY

Courier Corporation *This text employs vector methods to explore the classical theory of curves and surfaces. Topics include basic* *theory of tensor algebra, tensor calculus, calculus of differential forms, and elements of Riemannian geometry. 1959 edition.*

INTRODUCTION TO THE GEOMETRY OF N DIMENSIONS

Courier Dover Publications *Classic exploration of topics of perennial interest to geometers: fundamental ideas of incidence, parallelism, perpendicularity, angles between linear spaces, polytopes. Examines analytical geometry from projective and analytic points of view. 1929 edition.*

GEOMETRY, RELATIVITY AND THE FOURTH DIMENSION

Courier Corporation *Exposition of fourth dimension, concepts of relativity as Flatland characters continue adventures. Topics include curved space time as a higher dimension, special relativity, and shape of space-time. Includes 141 illustrations.*

THE SHAPE OF SPACE

CRC Press *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.*

THE MATHEMATICS OF MINKOWSKI SPACE-TIME

WITH AN INTRODUCTION TO COMMUTATIVE HYPERCOMPLEX NUMBERS

Springer Science & Business Media *This book arose out of original research on the extension of well-established applications of complex numbers related to Euclidean geometry and to the space-time symmetry of two-dimensional Special Relativity. The system of hyperbolic numbers is extensively studied, and a plain exposition of space-time geometry and trigonometry is given. Commutative hypercomplex systems with four unities are studied and attention is drawn to their interesting properties.*

AN INTRODUCTION TO THE GEOMETRY OF NUMBERS

Springer Science & Business Media *From the reviews: "A well-written, very thorough account ... Among the topics are lattices, reduction, Minkowskis Theorem, distance functions, packings, and automorphs; some applications to number theory; excellent bibliographical references." The American Mathematical Monthly*