Geometrie Der Raumzeit Eine Mathematische Einfuhr

Geometry and Monadology
Geometry of Moment Spaces
Geometrie des Universums
Raum, Zeit und Relativitätstheorie
“Die” Lehren von Raum, Zeit und Mathematik in der neueren Philosophie
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Noncommutative Spacetimes
Space, Time, and Geometry
The Geometry of Special Relativity
Die Lehren von Raum, Zeit und Mathematik in der neueren Philosophie nach ihrem ganzen Einfluss dargestellt und beurtheilt
Raum · Zeit · Materie
Raum, Zeit, Materie
Geometrie der Raumzeit
Geometry of Time and Space
Beiträge zur phänomenologischen Begründung der Geometrie und ihrer physikalischen Anwendung
Geometry Of Time And Space
The Geometry of Spacetime
Geometrie, Raum und Zeit
Geometry of Time and Space
Felix Hausdorff - Gesammelte Werke Band VI
Orthogonality and Spacetime Geometry
Raum. Zeit. Materie
Towards a Theory of Spacetime Theories
Space, Time and Geometry

Beiträge zur phänomenologischen Begründung der Geometrie und ihrer physikalischen Anwendung
Space-Time Algebra

DOUGLAS RIGOBERTO

Geometry and Monadology Cambridge University Press
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Geometry of Moment Spaces Springer Science & Business Media
This book reconstructs, from both historical and theoretical points of view, Leibniz’s geometrical studies, focusing in particular on the research Leibniz carried out in his final years. The work’s main purpose is to offer a better understanding of the philosophy of space and in general of the mature Leibnizean metaphysics. This is the first ever, comprehensive historical reconstruction of Leibniz’s geometry.
Geometrie des Universums Hassell Street Press
Band VI der Hausdorff Edition enthält veröffentlichte Aufsätze sowie bislang unveröffentlichte Schriften und Notizen von Felix Hausdorff zur Erkenntniskritik von Zeit und Raum sowie zur nichteuklidischen Geometrie. Er dokumentiert Hausdorffs lebenslanges Interesse an diesen Themen und erlaubt einen neuen Einblick in die Herausbildung einer modernen Epistemologie der Mathematik und der Naturwissenschaften. Er zeigt auch, wie Hausdorffs mathematische, philosophische und literarische Tätigkeiten in seiner intellektuellen Laufbahn interagierten. Die historische Einführung des Herausgebers bietet umfassende Informationen über Hausdorffs philosophischen Horizont. Alle Leserinnen und Leser, die an der Entstehung der modernen Mathematik und ihrer philosophischen Reflexion interessiert sind, werden diesen Band der Gesammelten Werke Hausdorffs mit Gewinn lesen. Volume VI of the Hausdorff Edition contains published articles and previously unpublished material by Felix Hausdorff relating to the epistemology of time and space, as well as on noneuclidean geometry. It documents Hausdorff’s lifelong interest in these issues and provides new insight into the formation of a modern epistemology of mathematics and of science. The volume also documents how Hausdorff’s mathematical, philosophical and literary work interacted throughout his career. The editor’s historical introduction provides a wealth of information about Hausdorff’s philosophical background. Everyone interested in the emergence of modern mathematics and its philosophical contexts will profit from reading this volume of Hausdorff’s Collected Works.
Raum, Zeit und Relativitätstheorie Birkhäuser
Historical interest and studies of Weyl's role in the interplay between 20th-century mathematics, physics and philosophy have been increasing since the middle 1980s, triggered by different activities at the occasion of the centenary of his birth in 1985, and are far from being exhausted. The present book takes Weyl's "Raum - Zeit - Materie" (Space - Time - Matter) as center of concentration and starting field for a broader look at his work. The contributions in the first part of this volume discuss Weyl's deep involvement in relativity, cosmology and matter theories between the classical unified field theories and quantum physics from the perspective of a creative mind struggling against theories of nature restricted by the view of classical determinism. In the second part of this volume, a broad and detailed introduction is given to Weyl's work in the mathematical sciences in general and in philosophy. It covers the whole range of Weyl's mathematical and physical interests: real analysis, complex function theory and Riemann surfaces, elementary ergodic theory, foundations of mathematics, differential geometry, general relativity, Lie groups, quantum mechanics, and number theory.
“Die” Lehren von Raum, Zeit und Mathematik in der neueren Philosophie Рипол Классик
Das Studium von Hermann Weyls Raum . Zeit . Materie ist auch heute noch lohnenswert. Als erste systematische Gesamtdarstellung der speziellen und allgemeinen Relativitätstheorie einschließlich der zugehörigen Mathematik setzt es sich gründlich mit den historischen Wurzeln auseinander. Die Betonung des Begriffs des linearen Zusammenhangs unabhängig von der Metrik kommt der heutigen Auffassung und den Verallgemeinerungen in den Eichtheorien entgegen. Für ein gründliches Verständnis der modernen Eichtheorie ist Weyls Buch immer noch eine wichtige Grundlage.
Spacetime and Singularities Springer-Verlag
A detailed description of what the fourth dimension would be like.
In Search of the Riemann Zeros Springer Science & Business Media
This book examines the geometrical notion of orthogonality, and shows how to use it as the primitive concept on which to base a metric structure in affine geometry. The subject has a long history, and an extensive literature, but whatever novelty there may be in the study presented here comes from its focus on geometries hav ing lines that are self-orthogonal, or even singular (orthogonal to all lines). The most significant examples concern four-dimensional special-relativistic spacetime (Minkowskian geometry), and its var ious sub-geometries, and these will be prominent throughout. But the project is intended as an exercise in the foundations of geome try that does not presume a knowledge of physics, and so, in order to provide the appropriate intuitive background, an initial chapter has been included that gives a description of the different types of line (timelike, spacelike, lightlike) that occur in spacetime, and the physical meaning of the orthogonality relations that hold between them. The coordinatisation of affine spaces makes use of constructions from projective geometry, including standard results about the ma trix represent ability of certain projective transformations (involu tions, polarities). I have tried to make the work sufficiently self contained that it may be used as the basis for a course at the ad vanced undergraduate level, assuming only an elementary

knowledge of linear and abstract algebra.

Hermann Weyl's Raum-Zeit-Materie and a General Introduction to His Scientific Work Springer Nature

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.

Empirische Geometrie und Raum-Zeit-Theorie in mengentheoretischer Darstellung Birkhäuser

There are many approaches to noncommutative geometry and its use in physics, the ? operator algebra and C -algebra one, the deformation quantization one, the qu- tum group one, and the matrix algebra/fuzzy geometry one. This volume introduces and develops the subject by presenting in particular the ideas and methods recently pursued by Julius Wess and his group. These methods combine the deformation quantization approach based on the - tion of star product and the deformed (quantum) symmetries methods based on the theory of quantum groups. The merging of these two techniques has proven very fruitful in order to formulate ?eld theories on noncommutative spaces. The aim of the book is to give an introduction to these topics and to prepare the reader to enter the research ?eld himself/herself. This has developed from the constant interest of Prof. W. Beiglboeck, editor of LNP, in this project, and from the authors experience in conferences and schools on the subject, especially from their interaction with students and young researchers. In fact quite a few chapters in the book were written with a double purpose, on the one hand as contributions for school or conference proceedings and on the other handaschaptersforthepresentbook.Thesearenowharmonizedandcomplemented by a couple of contributions that have been written to provide a wider background, to widen the scope, and to underline the power of our methods.

Hermann Weyl’s Raum - Zeit - Materie and a General Introduction to His Scientific Work Springer-Verlag

Die Relativitätstheorie ist in ihren Kernaussagen nicht mehr umstritten, gilt aber noch immer als kompliziert und nur schwer verstehbar. Das liegt unter anderem an dem aufwendigen mathematischen Apparat, der schon zur Formulierung ihrer Ergebnisse und erst recht zum Nachvollziehen der Argumentation notwendig ist. In diesem Lehrbuch werden die mathematischen Grundlagen der Relativitätstheorie systematisch entwickelt, das ist die Differentialgeometrie auf Mannigfaltigkeiten einschließlich Differentiation und Integration. Die Spezielle Relativitätstheorie wird als Tensorrechnung auf den Tangentialräumen dargestellt. Die zentrale Aussage der Allgemeinen Relativitätstheorie ist die Einstein'sche Feldgleichung, die die Krümmung zur Materie in Beziehung setzt. Ausführlich werden die relativistischen Effekte im Sonnensystem einschließlich der Schwarzen Löcher behandelt. Dieser Text richtet sich an Studierende der Physik und der Mathematik und setzt nur Grundkenntnisse aus der klassischen Differential- und Integralrechnung und der Linearen Algebra voraus. Für die neue Auflage wurde das Buch durchgesehen und alle bekannt gewordenen Fehler korrigiert.

Mathematische Analyse des Raumproblems Springer-Verlag

Osserman erzählt lebendig und anschaulich eine Geschichte der Geometrie, von der Bestimmung der Erdgestalt und -größe durch die alten Griechen über das Problem der Kartierung der Weltkugel bis hin zur gekrümmten Raumzeit, den Fraktalen und Buckyballs. Viele wird überraschen, dass in der Mathematik nicht nur analytisches Denken zählt, sondern dass Imagination, Phantasie und Kreativität viel wichtiger sind. Dies und die Schönheit der Mathematik schlagen die Brücke zur Bildenden Kunst und Literatur, so nimmt Dante in seiner Göttlichen Komödie das Riemannsche Universum vorweg - zudem besteht eine frappante Analogie zwischen Dantes Göttlichem Licht und dem Urknall. Auch menschliche Aspekte kommen nicht zu kurz: Euler, Gauß und Riemann werden zum Beispiel als mathematische Entsprechungen von Bach, Beethoven und Brahms vorgestellt.

Die Lehren von Raum Springer Science & Business Media

Das Lehrbuch soll Studierende mit Grundkenntnissen der Differential- und Integralrechnung in die klassische Feldtheorie mit modernen mathematischen Methoden einführen. Dementsprechend ist die Tensoranalysis das mathematische Thema, das Prinzip der Relativität das physikalische. Aus didaktischen Erwägungen gliedert sich der Text in zwei Teile. Um den Leser mit den Objekten vertraut zu machen, wird zunächst der affine und euklidische Raum zugrundegelegt, um verallgemeinernd zur Geometrie auf Mannigfaltigkeiten und Riemannschen Räumen überleiten zu können. Im Anschluß an die mathematische Theorie wird in die spezielle und allgemeine Relativitätstheorie eingeführt, wobei die Geometrie der Raum-Zeit, die Grundgesetze der Elektrodynamik und der Gravitation sowie Folgerungen zur Sprache kommen.

Ideas of Space Springer-Verlag

Abstract: Die klassische Mechanik, wie sie von Newton begründet wurde, setzt Geometrie und Raum-Zeit-Theorie (auch Kinematik genannt) als Werkzeuge voraus. Aber Geometrie und Raum-Zeit-Theorie werden heute als Teilgebiete der Mathematik betrachtet und als abstrakte mathematische Theorien behandelt. Wie kommt es dann, daß solch abstrakte Theorien sich in der Mechanik als Werkzeuge erfolgreich anwenden lassen? W. Balzer bietet eine neue Formulierung von Geometrie und Raum-Zeit-Theorie an, durch die der Zusammenhang zwischen realer, geometrischer Erfahrung und theoretischer Aussage der Mechanik verständlich wird

Raum, Zeit und Relativität Springer

Aus dem Vorwort von Jürgen Ehlers zur 7. Auflage: "Die ... Entwicklung der Physik macht verständlich, warum ein so "altes" Werk wie Raum, Zeit, Materie noch aktuell ist: Die Riemann-Einsteinsche Raumzeitstruktur, die von Weyl so meisterhaft beschrieben und aus ihren mathematischen und physikalischen Wurzeln hervorwachsend dargestellt wird, ist immer noch die physikalisch umfassendste und erfolgreichste Raumzeittheorie, die bisher entwickelt und mit der Erfahrung konfrontiert wurde. (...) Als erstes Lehrbuch der noch neuen Theorie setzt es sich gründlicher als spätere Bücher mit den historischen Wurzeln und den sachlichen Motiven auseinander, die zur Einführung der damals neuen Begriffe wie Zusammenhang und Krümmung in die Physik geführt haben. Zweitens ist es von dem vielleicht letzten Universalisten geschrieben worden, der alle wesentlichen Entwicklungen der Mathematik und Physik seiner Zeit nicht nur überblickte, sondern in wesentlichen Teilen mitgestaltete. Das Studium dieses Werkes vermittelt nicht nur die Grundzüge der beiden Relativitätstheorien, sondern zeigt Zusammenhänge mit anderen Ideen, nicht zuletzt auch der Naturphilosophie auf."

“Die” Lehren von Raum, Zeit und Mathematik in der

neueren Philosophie Springer-Verlag
There are many approaches to noncommutative geometry and to its use in physics. This volume addresses the subject by combining the deformation quantization approach, based on the notion of star-product, and the deformed quantum symmetries methods, based on the theory of quantum groups. The aim of this work is to give an introduction to this topic and to prepare the reader to enter the research field quickly. The order of the chapters is "physics first": the mathematics follows from the physical motivations (e.g. gauge field theories) in order to strengthen the physical intuition. The new mathematical tools, in turn, are used to explore further physical insights. A last chapter has been added to briefly trace Julius Wess' (1934-2007) seminal work in the field.
Theoretical Foundations of Cosmology Springer-Verlag
This small book started a profound revolution in the development of mathematical physics, one which has reached many working physicists already, and which stands poised to bring about far-reaching change in the future. At its heart is the use of Clifford algebra to unify otherwise disparate mathematical languages, particularly those of spinors, quaternions, tensors and differential forms. It provides a unified approach covering all these areas and thus leads to a very efficient ‘toolkit’ for use in physical problems including quantum mechanics, classical mechanics, electromagnetism and relativity (both special and general) – only one mathematical system needs to be learned and understood, and one can use it at levels which extend right through to current research topics in each of these areas. These same techniques, in the form of the ‘Geometric Algebra’, can be applied in many areas of engineering, robotics and computer science, with no changes necessary – it is the same underlying mathematics, and enables physicists to understand topics in engineering, and engineers to understand topics in physics (including aspects in frontier areas), in a way which no other single mathematical system could hope to make possible. There is another aspect to Geometric Algebra, which is less tangible, and goes beyond questions of mathematical power and range. This is the remarkable insight it gives to physical problems, and the way it constantly suggests new features of the physics itself, not just the mathematics. Examples of this are peppered throughout ‘Space-Time Algebra’, despite its short length, and some of them are effectively still research topics for the future. From the Foreward by Anthony Lasenby
The Fourth Dimension Walter de Gruyter GmbH & Co KG
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 editonal 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.
Geometrische Strukturen der Kontinuumsphysik Oxford University Press, USA
An elementary introduction to the geometrical methods and notions used in special and general relativity. Emphasizes the ideas concerned with structure of space-time that play a role in Penrose-Hawking singularity theorems.
Noncommutative Spacetimes World Scientific
This unique book presents a particularly beautiful way of looking at special relativity. The author encourages students to see beyond the formulas to the deeper structure. The unification of space and time introduced by Einstein’s special theory of relativity is one of the cornerstones of the modern scientific description of the universe. Yet the unification is counterintuitive because we perceive time very differently from space. Even in relativity, time is not just another dimension, it is one with different properties The book treats the geometry of hyperbolas as the key to understanding special relativity. The author simplifies the formulas and emphasizes their geometric content. Many important relations, including the famous relativistic addition formula for velocities, then follow directly from the appropriate (hyperbolic) trigonometric addition formulas. Prior mastery of (ordinary) trigonometry is sufficient for most of the material presented, although occasional use is made of elementary differential calculus, and the chapter on electromagnetism assumes some more advanced knowledge. Changes to the Second Edition The treatment of Minkowski space and spacetime diagrams has been expanded. Several new topics have been added, including a geometric derivation of Lorentz transformations, a discussion of three-dimensional spacetime diagrams, and a brief geometric description of "area" and how it can be used to measure time and distance. Minor notational changes were made to avoid conflict with existing usage in the literature. Table of Contents Preface 1. Introduction. 2. The Physics of Special Relativity. 3. Circle Geometry. 4. Hyperbola Geometry. 5. The Geometry of Special Relativity. 6. Applications. 7. Problems III. 8. Paradoxes. 9. Relativistic Mechanics. 10. Problems II. 11. Relativistic Electromagnetism. 12. Problems III. 13. Beyond Special Relativity. 14. Three-Dimensional Spacetime Diagrams. 15. Minkowski Area via Light Boxes. 16. Hyperbolic Geometry. 17. Calculus. Bibliography. Author Biography Tevian Dray is a Professor of Mathematics at Oregon State University. His research lies at the interface between mathematics and physics, involving differential geometry and general relativity, as well as nonassociative algebra and particle physics; he also studies student understanding of "middle-division" mathematics and physics content. Educated at MIT and Berkeley, he held postdoctoral positions in both mathematics and physics in several countries prior to coming to OSU in 1988. Professor Dray is a Fellow of the American Physical Society for his work in relativity, and an award-winning teacher.
Tensoren und Felder Houghton Mifflin Harcourt
The book's principal aim is to clarify fundamental concepts, decipher mathematical structures used to model space-time and relativistic worlds, and to disclose their physical meaning. After each chapter, philosophical implications of the presented material are commented upon.Both special and general theories of

relativity are presented in the book with the stress on their global aspects. Although global mathematical methods are extensively used throughout the book, the definitions of new concepts, short comments and examples make reading smooth without the need to consult other textbooks or review papers.