[MOBI] The Fourth Dimension And Non-Euclidean Geometry In Modern Art (Leonardo)

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The Fourth Dimension and Non-Euclidean Geometry in Modern Art-Linda Dalrymple Henderson 2018-04-18 The long-awaited new edition of a groundbreaking work on the impact of alternative concepts of space on modern art. In this groundbreaking study, first published in 1983 and unavailable for over a decade, Linda Dalrymple Henderson demonstrates that two concepts of space beyond immediate perception--the curved spaces of non-Euclidean geometry and, most important, a higher, fourth dimension of space--were central to the development of modern art. The possibility of

a spatial fourth dimension suggested that our world might be merely a shadow or section of a higher dimensional existence. That iconoclastic idea encouraged radical innovation by a variety of early twentieth-century artists, ranging from French Cubists, Italian Futurists, and Marcel Duchamp, to Max Weber, Kazimir Malevich, and the artists of De Stijl and Surrealism. In an extensive new Reintroduction, Henderson surveys the impact of interest in higher dimensions of space in art and culture from the 1950s to 2000. Although largely eclipsed by relativity theory beginning in the 1920s, the spatial fourth dimension experienced a resurgence during the later 1950s and 1960s. In a remarkable turn of events, it has returned as an important theme in contemporary culture in the wake of the emergence in the 1980s of both string theory in physics (with its ten- or eleven-dimensional universes) and computer graphics. Henderson demonstrates the importance of this new conception of space for figures ranging from Buckminster Fuller, Robert Smithson, and the Park Place Gallery group in the 1960s to Tony Robbin and digital architect Marcos Novak.

Geometry, Relativity and the Fourth Dimension-Rudolf Rucker 2012-06-08 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 Fourth Dimension Simply Explained-Henry Parker Manning 1910

Shadows of Reality-Tony Robbin 2008-10-01 In this insightful book, which is a revisionist math history as well as a revisionist art history, Tony Robbin, well known for his innovative computer visualizations of hyperspace, investigates different models of the fourth dimension and how these are

applied in art and physics. Robbin explores the distinction between the slicing, or Flatland, model and the projection, or shadow, model. He compares the history of these two models and their uses and misuses in popular discussions. Robbin breaks new ground with his original argument that Picasso used the projection model to invent cubism, and that Minkowski had four-dimensional projective geometry in mind when he structured special relativity. The discussion is brought to the present with an exposition of the projection model in the most creative ideas about space in contemporary mathematics such as twisters, quasicrystals, and quantum topology. Robbin clarifies these esoteric concepts with understandable drawings and diagrams. Robbin proposes that the powerful role of projective geometry in the development of current mathematical ideas has been long overlooked and that our attachment to the slicing model is essentially a conceptual block that hinders progress in understanding contemporary models of spacetime. He offers a fascinating review of how projective ideas are the source of some of today's most exciting developments in art, math, physics, and computer visualization.

The Emergence of the Fourth Dimension-Mark Blacklock 2018-04-19 The Emergence of the Fourth Dimension describes the development and proliferation of the idea of higher dimensional space in the late nineteenth- and early twentieth-centuries. An idea from mathematics that was appropriated by occultist thought, it emerged in the fin de siecle as a staple ofgenre fiction and influenced a number of important Modernist writers and artists. Providing a context for thinking of space in dimensional terms, the volume describes an active interplay between self-fashioning disciplines and a key moment in the popularisation of science. It offers new research into spiritualism and the Theosophical Society and studies a series of curious

hybridtexts. Examining works by Joseph Conrad, Ford Madox Ford, H.G. Wells, Henry James, H. P. Lovecraft, and others, the volume explores how new theories of the possibilities of time and space influenced fiction writers of the period, and how literature shaped, and was in turn shaped by, thereconfiguration of imaginative space occasioned by the n-dimensional turn. A timely study of the interplay between philosophy, literature, culture, and mathematics, it offers a rich resource for readers interested in nineteenth century literature, Modernist studies, science fiction, and gothic scholarship.

Matta and the Fourth Dimension-Dmitry Ozerkov 2020-01-09 The works of Roberto Matta (1911-2002) on the occasion of the first exhibition in Russia devoted to one of the last Surrealist masters. Published on the occasion of the first exhibition in Russia, the volume features over 60 works showing Roberto Matta's unique understanding of space and the evolution of the artist who was able to find his own vison of the world through the fourth dimension and project it on canvas. Roberto Antonio Sebastian Matta Echaurren was born in 1911 in Santiago, Chile. A cosmopolitan artist (mixed Spanish, Basque and French origin), Matta lived and worked in South America, France, Mexico, the US, Italy, Spain and England. Urged by his parents who did not believe painting could be a serious enough occupation, Matta received a degree in Architecture at Catholic University in Santiago. While in the employ of Le Corbusier in Paris in the 1930s, he met the Surrealists and worked on his drawing. Courage, thirst for knowledge, being open to new trends in art, deep psychological insight and keen interest in technical progress made Roberto Matta an outstanding figure in the world of art. Rejecting the formal boundaries of style, he always checked his art with reality, trying to learn the depths of a human nature. Affected by the ideas of non-Euclidian geometry, Matta tried to give shape to the structures built in his mind, to

create space beyond the visible, conventional perspective. After taking part in the International Surrealist Exhibition of 1938, largely thanks to his friendship with the English painter Gordon Onslow Ford, Matta started researching what he called "psychological morphologies." Ford introduced him to the works of Peter D. Ouspensky, a Russian philosopher and a theorist of the "fourth dimension." Matta shared Ouspensky's idea that the fourth dimension adds to the third dimension the feeling of space, of motion and of time that is essential for one to realize the constant and irreversible process of change in the world, where every new moment is different from the previous one.

The Artist, "the Fourth Dimension," and Non-Euclidean Geometry 1900-1930-Linda Dalrymple Henderson 1984

The Fourth Dimension: Toward a Geometry of Higher Reality-Rudy Rucker 2014-08-18 One of the most talented contemporary authors of cutting-edge math and science books conducts a fascinating tour of a higher reality, the fourth dimension. Includes problems, puzzles, and 200 drawings. "Informative and mind-dazzling." — Martin Gardner.

Worlds Out of Nothing-Jeremy Gray 2011-02-01 Based on the latest historical research, Worlds Out of Nothing is the first book to provide a course on the history of geometry in the 19th century. Topics covered in the first part of the book are projective geometry, especially the concept of duality, and non-Euclidean geometry. The book then moves on to the study of the singular points of algebraic curves (Plücker's equations) and their role in resolving a paradox in the theory of duality; to Riemann's work on differential geometry; and to Beltrami's role in successfully establishing non-Euclidean geometry as a rigorous mathematical subject. The final part of the book considers how projective

geometry rose to prominence, and looks at Poincaré's ideas about non-Euclidean geometry and their physical and philosophical significance. Three chapters are devoted to writing and assessing work in the history of mathematics, with examples of sample questions in the subject, advice on how to write essays, and comments on what instructors should be looking for.

A Primer of Higher Space (the Fourth Dimension)-Claude Fayette Bragdon 1913

The Fourth Dimension-Charles Howard Hinton 1906

GEOMETRY OF FOUR DIMENSIONS-HENRY PARKER MANNING 1914

Against the Day-Thomas Pynchon 2012-06-13 A New York Times Notable Book of the Year, a Washington Post Best Book of the Year Spanning the era between the Chicago World's Fair of 1893 and the years just after World War I, and constantly moving between locations across the globe (and to a few places not strictly speaking on the map at all), Against the Day unfolds with a phantasmagoria of characters that includes anarchists, balloonists, gamblers, drug enthusiasts, mathematicians, mad scientists, shamans, spies, and hired guns. As an era of uncertainty comes crashing down around their ears and an unpredictable future commences, these folks are mostly just trying to pursue their lives. Sometimes they manage to catch up; sometimes it's their lives that pursue them.

Fourfield-Tony Robbin 1992 Discusses space in art and mathematics, the geometry of the fourth dimension, pattern recognition, time in space, and spatial concepts

Euclidean and Non-Euclidean Geometries-Marvin J. Greenberg 1993-07-15 This classic text provides overview of both

classic and hyperbolic geometries, placing the work of key mathematicians/ philosophers in historical context. Coverage includes geometric transformations, models of the hyperbolic planes, and pseudospheres.

The Fourth Dimension-Rudy von Bitter Rucker 1985 A detailed description of what the fourth dimension would be like.

A New Perspective on Relativity-Bernard H. Lavenda 2012 Starting off from noneuclidean geometries, apart from the method of Einstein's equations, this book derives and describes the phenomena of gravitation and diffraction. A historical account is presented, exposing the missing link in Einstein's construction of the theory of general relativity: the uniformly rotating disc, together with his failure to realize, that the Beltrami metric of hyperbolic geometry with constant curvature describes exactly the uniform acceleration observed. This book also explores these questions: * How does time bend? * Why should gravity propagate at the speed of light? * How does the expansion function of the universe relate to the absolute constant of the noneuclidean geometries? * Why was the Sagnac effect ignored? * Can Maxwell's equations accommodate mass? * Is there an inertia due solely to polarization? * Can objects expand in elliptic geometry like they contract in hyperbolic geometry?

Hyperspace-Michio Kaku 2016-04-20 Reissued in new covers, this is the run-away bestseller from one of the world's leading theoretical physicists. Are there other dimensions beyond our own? Is time travel possible? Michio Kaku takes us on a tour of the most exciting work in modern physics, including research into the 10th dimension, time warps, and multiple universes, to outline what may be the leading candidate for the Theory of Everything.

Visualizing Mathematics with 3D Printing-Henry Segerman 2016-10-04 With the book in one hand and a 3D printed model in the other, readers can find deeper meaning while holding a hyperbolic honeycomb, touching the twists of a torus knot, or caressing the curves of a Klein quartic.

From Energy to Information-Bruce Clarke 2002 This book offers an innovative examination of the interactions of science and technology, art, and literature in the nineteenth and twentieth centuries. Scholars in the history of art, literature, architecture, computer science, and media studies focus on five historical themes in the transition from energy to information: thermodynamics, electromagnetism, inscription, information theory, and virtuality. Different disciplines are grouped around specific moments in the history of science and technology in order to sample the modes of representation invented or adapted by each field in response to newly developed scientific concepts and models. By placing literary fictions and the plastic arts in relation to the transition from the era of energy to the information age, this collection of essays discovers unexpected resonances among concepts and materials not previously brought into juxtaposition. In particular, it demonstrates the crucial centrality of the theme of energy in modernist discourse. Overall, the volume develops the scientific and technological side of the shift from modernism to postmodernism in terms of the conceptual crossover from energy to information. The contributors are Christoph Asendorf, Ian F. A. Bell, Robert Brain, Bruce Clarke, Charlotte Douglas, N. Katherine Hayes, Linda Dalrymple Henderson, Bruce J. Hunt, Douglas Kahn, Timothy Lenoir, W. J. T. Mitchell, Marcos Novak, Edward Shanken, Richard Shiff, David Tomas, Sha Xin Wei, and Norton Wise.

Jerusalem-Alan Moore 2016-09-13 The New York

Times bestseller from the author of Watchmen and V for Vendetta finally appears in a one-volume paperback. Begging comparisons to Tolstoy and Joyce, this “magnificent, sprawling cosmic epic” (Guardian) by Alan Moore—the genre-defying, “groundbreaking, hairy genius of our generation” (NPR)—takes its place among the most notable works of contemporary English literature. In decaying Northampton, eternity loiters between housing projects. Among saints, kings, prostitutes, and derelicts, a timeline unravels: second-century fiends wait in urine-scented stairwells, delinquent specters undermine a century with tunnels, and in upstairs parlors, laborers with golden blood reduce fate to a snooker tournament. Through the labyrinthine streets and pages of Jerusalem tread ghosts singing hymns of wealth and poverty. They celebrate the English language, challenge mortality post-Einstein, and insist upon their slum as Blake’s eternal holy city in “Moore’s apotheosis, a fourth-dimensional symphony” (Entertainment Weekly). This “brilliant . . . monumentally ambitious” tale from the gutter is “a massive literary achievement for our time—and maybe for all times simultaneously” (Washington Post).

Einstein, Picasso-Arthur I Miller 2008-08-01 The most important scientist of the twentieth century and the most important artist had their periods of greatest creativity almost simultaneously and in remarkably similar circumstances. This fascinating parallel biography of Albert Einstein and Pablo Picasso as young men examines their greatest creations -- Picasso's Les Demoiselles d'Avignon and Einstein's special theory of relativity. Miller shows how these breakthroughs arose not only from within their respective fields but from larger currents in the intellectual culture of the times. Ultimately, Miller shows how Einstein and Picasso, in a deep and important sense, were both working on the same problem.

Mathematics and the Imagination-Edward Kasner 2013-04-22 With wit and clarity, the authors progress from simple arithmetic to calculus and non-Euclidean geometry. Their subjects: geometry, plane and fancy; puzzles that made mathematical history; tantalizing paradoxes; more. Includes 169 figures.

Duchamp in Context-Linda Dalrymple Henderson 2005 Between 1912 and 1918, Marcel Duchamp made hundreds of notes in preparation for the execution of his major work, The Bride Stripped Bare by Her Bachelors, Even (1915-23), also known as the Large Glass. Considering these notes to be as important as the Glass itself, Duchamp published three sets during his lifetime - 178 notes in all. But since his death in 1968, more than 100 further notes about the work have been discovered and published.

Things to Make and Do in the Fourth Dimension-Matt Parker 2014-12-02 A book from the stand-up mathematician that makes math fun again! Math is boring, says the mathematician and comedian Matt Parker. Part of the problem may be the way the subject is taught, but it's also true that we all, to a greater or lesser extent, find math difficult and counterintuitive. This counterintuitiveness is actually part of the point, argues Parker: the extraordinary thing about math is that it allows us to access logic and ideas beyond what our brains can instinctively do—through its logical tools we are able to reach beyond our innate abilities and grasp more and more abstract concepts. In the absorbing and exhilarating Things to Make and Do in the Fourth Dimension, Parker sets out to convince his readers to revisit the very math that put them off the subject as fourteen-year-olds. Starting with the foundations of math familiar from school (numbers, geometry, and algebra), he reveals how it is possible to climb all the way up to the

topology and to four-dimensional shapes, and from there to infinity—and slightly beyond. Both playful and sophisticated, Things to Make and Do in the Fourth Dimension is filled with captivating games and puzzles, a buffet of optional hands-on activities that entices us to take pleasure in math that is normally only available to those studying at a university level. Things to Make and Do in the Fourth Dimension invites us to re-learn much of what we missed in school and, this time, to be utterly enthralled by it.

Art Meets Mathematics in the Fourth Dimension- Stephen Leon Lipscomb 2014-10-13 To see objects that live in the fourth dimension we humans would need to add a fourth dimension to our three-dimensional vision. An example of such an object that lives in the fourth dimension is a hyper-sphere or "3-sphere." The quest to imagine the elusive 3-sphere has deep historical roots: medieval poet Dante Alighieri used a 3-sphere to convey his allegorical vision of the Christian afterlife in his Divine Comedy. In 1917, Albert Einstein visualized the universe as a 3-sphere, describing this imagery as "the place where the reader's imagination boggles. Nobody can imagine this thing." Over time, however, understanding of the concept of a dimension evolved. By 2003, a researcher had successfully rendered into human vision the structure of a 4-web (think of an ever increasingly-dense spider's web). In this text, Stephen Lipscomb takes his innovative dimension theory research a step further, using the 4-web to reveal a new partial image of a 3-sphere. Illustrations support the reader's understanding of the mathematics behind this process. Lipscomb describes a computer program that can produce partial images of a 3-sphere and suggests methods of discerning other fourth-dimensional objects that may serve as the basis for future artwork.

Scientific Romances- Charles Howard Hinton 1896

Flatterland-Ian Stewart 2010-10-08 first there was Edwin A. Abbott's remarkable Flatland, published in 1884, and one of the all-time classics of popular mathematics. Now, from mathematician and accomplished science writer Ian Stewart, comes what Nature calls ''a superb sequel.'' Through larger-than-life characters and an inspired story line, Flatter land explores our present understanding of the shape and origins of the universe, the nature of space, time, and matter, as well as modern geometries and their applications. The journey begins when our heroine, Victoria Line, comes upon her great-great-grandfather A. Square's diary, hidden in the attic. The writings help her to contact the Space Hopper, who tempts her away from her home and family in Flatland and becomes her guide and mentor through ten dimensions. In the tradition of Alice in Wonderland and The Phantom Toll Booth, this magnificent investigation into the nature of reality is destined to become a modern classic.

Flatland-Edwin Abbott Abbott 2007-06-01 Classic of science (and mathematical) fiction -- charmingly illustrated by author -- describes the journeys of A. Square and his adventures in Spaceland (three dimensions), Lineland (one dimension) and Pointland (no dimensions). A. Square also entertains thoughts of visiting a land of four dimensions -- a revolutionary idea for which he is banished from Spaceland.

The Fourth Dimension Simply Explained-Henry Parker Manning 1910

A New Era of Thought-Charles Howard Hinton 1888

Introduction to the Geometry of N Dimensions-D. M.Y. Sommerville 2020-03-19 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.

The Fourth Dimension and the Bible-William Anthony Granville 1922

Surrealism, Art, and Modern Science-Gavin Parkinson 2008 During the same period that Surrealism originated and flourished between the wars, great advances were being made in the field of physics. This book offers the first full history, analysis and interpretation of Surrealism's engagement with the theory of relativity and quantum mechanics, and its reception of the philosophical consequences of those two major turning points in our understanding of the physical world. After surveying the revolution in physics in the early twentieth century and the discoveries of Planck, Bohr, Einstein, Schrodinger, and others, Gavin Parkinson explores the diverse uses of physics by individuals in and around the Surrealist group in Paris. In so doing, he offers exciting new readings of the art and writings of such key figures of the Surrealist milieu as André Breton, Georges Bataille, Salvador Dalí, Roger Caillois, Max Ernst, and Tristan Tzara.

What Einstein Did Not See-Thomas W. Sills 2009-06-01 Today physics sees time and space as two words that seem to defy definition. One unique definition for each of these words will not help to describe the complex nature of time and space. Further, definitions for time and space require more than seeing how they interrelate with each other. One uses different mathematical geometries to describe space. Understanding these different geometries provides a better approach to defining both time and space. In the seventeenth century, Euclidean geometry limited Isaac Newton to a three-dimensional space. Two parallel lines will never merge epitomizes Euclidean

geometry. In the nineteenth century new geometry evolved. Sometimes called non-Euclidean, or Riemann geometry, this new geometry applies to space with more than three dimensions. Einstein used this geometry in his theory of general relativity. Two parallel lines will merge epitomizes non-Euclidean geometry. This book presents a new approach to both time and space. For the first time, readers will see how Euclidean geometry can describe space with more than three dimensions. This new approach redefines time into two different components: a vector of Timespace and a scalar of Universal Time. Amazing insights result from this new approach. Three-dimensional projections from four-dimensional Euclidean space can now visually illustrate time travel. Contraction of Timespace, the fourth physical dimension, becomes equivalent to Einstein's time dilation. General knowledge of Euclidean geometry allows the reader to understand the complex nature of higher dimensions in a new way. Readers enjoy a friendly, informative walk into four, and higher, dimensions of space. New ideas in this book revise conventional physics. These ideas transform the three-dimensional world of conventional physics into a four-dimensional physical world.

The Boy Who Reversed Himself-William Sleator 1998-02-01 When Laura discovers that the unpopular boy living next door to her has the ability to go into the fourth dimension, she makes the dangerous decision to accompany him on his journeys there.

A Simple Non-Euclidean Geometry and Its Physical Basis-I.M. Yaglom 2012-12-06 There are many technical and popular accounts, both in Russian and in other languages, of the non-Euclidean geometry of Lobachevsky and Bolyai, a few of which are listed in the Bibliography. This geometry, also called hyperbolic geometry, is part of the required subject matter of

many mathematics departments in universities and teachers' colleges-a reflec tion of the view that familiarity with the elements of hyperbolic geometry is a useful part of the background of future high school teachers. Much attention is paid to hyperbolic geometry by school mathematics clubs. Some mathematicians and educators concerned with reform of the high school curriculum believe that the required part of the curriculum should include elements of hyperbolic geometry, and that the optional part of the curriculum should include a topic related to hyperbolic geometry. I The broad interest in hyperbolic geometry is not surprising. This interest has little to do with mathematical and scientific applications of hyperbolic geometry, since the applications (for instance, in the theory of automorphic functions) are rather specialized, and are likely to be encountered by very few of the many students who conscientiously study (and then present to examiners) the definition of parallels in hyperbolic geometry and the special features of configurations of lines in the hyperbolic plane. The principal reason for the interest in hyperbolic geometry is the important fact of "non-uniqueness" of geometry; of the existence of many geometric systems.

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.

The Mathematics of Harmony-Alexey Stakhov 2009 Assisted by Scott Olsen (Central Florida Community College, USA). This volume is a result of the author's four decades of research in the field of Fibonacci numbers and the Golden Section and their applications. It provides a broad introduction to the fascinating and beautiful subject of the OC Mathematics of Harmony, OCO a new interdisciplinary direction of modern science. This direction has its origins in OC The ElementsOCO of Euclid and has many unexpected applications in contemporary mathematics (a new approach to a history of mathematics, the generalized Fibonacci numbers and the generalized golden proportions, the OC goldenOCO algebraic equations, the generalized Binet formulas, Fibonacci and OC goldenOCO matrices), theoretical physics (new hyperbolic models of Nature) and computer science

(algorithmic measurement theory, number systems with irrational radices, Fibonacci computers, ternary mirror-symmetrical arithmetic, a new theory of coding and cryptography based on the Fibonacci and OC goldenOCO matrices). The book is intended for a wide audience including mathematics teachers of high schools, students of colleges and universities and scientists in the field of mathematics, theoretical physics and computer science. The book may be used as an advanced textbook by graduate students and even ambitious undergraduates in mathematics and computer science. Sample Chapter(s). Introduction (503k). Chapter 1: The Golden Section (2,459k). Contents: Classical Golden Mean, Fibonacci Numbers, and Platonic Solids: The Golden Section; Fibonacci and Lucas Numbers; Regular Polyhedrons; Mathematics of Harmony: Generalizations of Fibonacci Numbers and the Golden Mean; Hyperbolic Fibonacci and Lucas Functions; Fibonacci and Golden Matrices; Application in Computer Science: Algorithmic Measurement Theory; Fibonacci Computers; Codes of the Golden Proportion; Ternary Mirror-Symmetrical Arithmetic; A New Coding Theory Based on a Matrix Approach. Readership: Researchers, teachers and students in mathematics (especially those interested in the Golden Section and Fibonacci numbers), theoretical physics and computer science."

Five-dimensional Physics- Paul S. Wesson 2006 Extra dimensions -- beyond space and time -- are the best methods for unifying gravity with particle physics. The basic extension is to five dimensions (5D), as in the induced-matter and membrane theory. This descriptive text gives an up-to-date account of the classical and quantum consequences of 5D physics. It includes topics that range from Einstein's original theory of relativity to modern views on matter. The book is mathematically precise and focuses on new ideas which appeal to readers. Examples of new ideas are: The big-

bang universe, which is curved by matter in 4D, may be viewed as a smooth and empty world in 5D; the uncertainty of quantum interactions in spacetime may be regarded as the consequence of deterministic laws in higher dimensions. This book will interest people who think about the 'meaning of things'.