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In this setting—called a "free" theory because it ... question that mathematicians working in geometry, and the related field of topology, want to answer. "One particle even sitting ...

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Identifying a topological fingerprint

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First course in algebraic topology for advanced undergraduates. Homotopy theory, the duality theorem, relation of topological ideas to other branches of pure mathematics. Exercises and problems. 1972 edition.

Suitable for students and researchers in topology. this work provides the reader with an understanding of the physical properties of Euclidean 3-space - the space in which we presume we live.

This book provides a self-contained introduction to the topology and geometry of surfaces and three-manifolds. The main goal is to describe Thurston's geometrisation of three-manifolds, proved by Perelman in 2002. The book is divided into three parts: the first is devoted to hyperbolic geometry, the second to surfaces, and the third to three-manifolds. It contains complete proofs of Mostow's rigidity, the thick-thin decomposition, Thurston's classification of the diffeomorphisms of surfaces (via Bonahon's geodesic currents), the prime and JSJ decomposition, the topological and geometric classification of Seifert manifolds, and Thurston's hyperbolic Dehn filling Theorem.

The seminal 'MIT notes' of Dennis Sullivan were issued in June 1970 and were widely circulated at the time. The notes had a - jor in?uence on the development of both algebraic and geometric topology, pioneering the localization and completion of spaces in homotopy theory, including p-local, pro?nite and rational homotopy theory, le- ing to the solution of the Adams conjecture on the relationship between vector bundles and spherical ?brations, the formulation of the 'Sullivan conjecture' on the contractibility of the space of maps from the classifying space of a ?nite group to a ?nite dimensional CW complex, theactionoftheGalois groupoverQofthealgebraicclosureQof Q on smooth manifold structures in pro?nite homotopy theory, the K-theory orientation ofPL manifolds and bundles. Some of this material has been already published by Sullivan him- 1 self: in an article in the Proceedings of the 1970 Nice ICM, and in the 1974 Annals of Mathematics papers Genetics of homotopy theory and the Adams conjecture and The transversality character- 2 istic class and linking cycles in surgery theory . Many of the ideas originating in the notes have been the starting point of subsequent 1 reprinted at the end of this volume 2 joint with John Morgan vii viii 3 developments . However, the text itself retains a unique ?avour of its time, and of the range of Sullivan's ideas.

The uniqueness of this text in combining geometric topology and differential geometry lies in its unifying thread: the notion of a surface. With numerous illustrations, exercises and examples, the student comes to understand the relationship of the modern abstract approach to geometric intuition. The text is kept at a concrete level, avoiding unnecessary abstractions, yet never sacrificing mathematical rigor. The book includes topics not usually found in a single book at this level.

Geometric Topology is a foundational component of modern mathematics, involving the study of spacial properties and invariants of familiar objects such as manifolds and complexes. This volume, which is intended both as an introduction to the subject and as a wide ranging resouce for those already grounded in it, consists of 21 expository surveys written by leading experts and covering active areas of current research. They provide the reader with an up-to-date overview of this flourishing branch of mathematics.

Geometric topology may roughly be described as the branch of the topology of manifolds which deals with questions of the existence of homeomorphisms. Only in fairly recent years has this sort of topology achieved a sufficiently high development to be given a name, but its beginnings are easy to identify. The first classic result was the SchOnflies theorem (1910), which asserts that every 1-sphere in the plane is the boundary of a 2-cell. In the next few decades, the most notable affirmative results were the "Schonflies theorem" for polyhedral 2-spheres in space, proved by J. W. Alexander [Ad, and the triangulation theorem for 2-manifolds, proved by T. Rad6 [Rd. But the most striking results of the 1920s were negative. In 1921 Louis Antoine [A] published an extraordinary paper in which he 4 showed that a variety of plausible conjectures in the topology of 3-space were false. Thus, a (topological) Cantor set in 3-space need not have a simply connected complement; therefore a Cantor set can be imbedded in 3-space in at least two essentially different ways; a topological 2-sphere in 3-space need not be the boundary of a 3-cell; given two disjoint 2-spheres in 3-space, there is not necessarily any third 2-sphere which separates them from one another in 3-space; and so on and on. The well-known "horned sphere" of Alexander [A] appeared soon thereafter.

Differential geometry and topology have become essential tools for many theoretical physicists. In particular, they are indispensable in theoretical studies of condensed matter physics, gravity, and particle physics. Geometry, Topology and Physics, Second Edition introduces the ideas and techniques of differential geometry and topology at a level suitable for postgraduate students and researchers in these fields. The second edition of this popular and established text incorporates a number of changes designed to meet the needs of the reader and reflect the development of the subject. The book features a considerably expanded first chapter, reviewing aspects of path integral quantization and gauge theories. Chapter 2 introduces the mathematical concepts of maps, vector spaces, and topology. The following chapters focus on more elaborate concepts in geometry and topology and discuss the application of these concepts to liquid crystals, superfluid helium, general relativity, and bosonic string theory. Later chapters unify geometry and topology, exploring fiber bundles, characteristic classes, and index theorems. New to this second edition is the proof of the index theorem in terms of supersymmetric quantum mechanics. The final two chapters are devoted to the most fascinating applications of geometry and topology in contemporary physics, namely the study of anomalies in gauge field theories and the analysis of Polakov's bosonic string theory from the geometrical point of view. Geometry, Topology and Physics, Second Edition is an ideal introduction to differential geometry and topology for postgraduate students and researchers in theoretical and mathematical physics.

This book provides an introduction to topology, differential topology, and differential geometry. It is based on manuscripts refined through use in a variety of lecture courses. The first chapter covers elementary results and concepts from point-set topology. An exception is the Jordan Curve Theorem, which is proved for polygonal paths and is intended to give students a first glimpse into the nature of deeper topological problems. The second chapter of the book introduces manifolds and Lie groups, and examines a wide assortment of examples. Further discussion explores tangent bundles, vector bundles, differentials, vector fields, and Lie brackets of vector fields. This discussion is deepened and expanded in the third chapter, which introduces the de Rham cohomology and the oriented integral and gives proofs of the Brouwer Fixed-Point Theorem, the Jordan-Brouwer Separation Theorem, and Stokes's integral formula. The fourth and final chapter is devoted to the fundamentals of differential geometry and traces the development of ideas from curves to submanifolds of Euclidean spaces. Along the way, the book discusses connections and curvature--the central concepts of differential geometry. The discussion culminates with the Gauß equations and the version of Gauß's theorema egregium for submanifolds of arbitrary dimension and codimension. This book is primarily aimed at advanced undergraduates in mathematics and physics and is intended as the template for a one- or two-semester bachelor's course.

This book offers an introductory course in algebraic topology. Starting with general topology, it discusses differentiable manifolds, cohomology, products and duality, the fundamental group, homology theory, and homotopy theory. From the reviews: "An interesting and original graduate text in topology and geometry...a good lecturer can use this text to create a fine course....A beginning graduate student can use this text to learn a great deal of mathematics."—MATHEMATICAL REVIEWS