Zeitschrift: L'Enseignement Mathématique
Herausgeber: Commission Internationale de l'Enseignement Mathématique
Band: 45 (1999)
Heft: 3-4: L'ENSEIGNEMENT MATHÉMATIQUE

Kapitel: Topologie des variétés, analyse globale et analyse des variétés

theorems on Whitehead torsion and simple homotopy equivalences, and characterizes axiomatically the assumptions under which such results hold. This leads to a new combinatorial foundation of homology and homotopy. Numerous explicit examples and applications in various fields of topology and algebra are given.

Topologie des variétés, analyse globale et analyse des variétés

Peter L. ANTONELLI, Bradley C. LACKEY, (Editors). — **The theory of Finslerian Laplacians and applications.** — Mathematics and its applications, vol. 459. — Un vol. relié, 16,5×24,5, de XXIX, 282 p. — ISBN 0-7923-5313-7. — Prix: Dfl. 270.00. — Kluwer Academic Publishers, Dordrecht, 1998.

The text proper begins with a brief introduction to stochastically derived Finslerian Laplacians, facilitated by applications in ecology, epidemiology and evolutionary biology. The mathematical ideas are then fully presented in section II, with generalizations to Lagrange geometry following in section III. With section IV, the focus abruptly shifts to the local mean-value approach to Finslerian Laplacians and a Hodge-de Rham theory is developed for the representation on real cohomology classes by harmonic forms on the base manifold. Similar results are proved in sections II and IV, each from different perspectives.

Bill BRUCE, David MOND, (Editors). — **Singularity theory.** — Proceedings of the European Singularities Conference, Liverpool, August 1996. — London Mathematical Society lecture note series, vol. 263. — Un vol. broché, 15,5×23, de XXIV, 440 p. — ISBN 0-521-65888-8. — Prix: £29.95. — Cambridge University Press, Cambridge, 1999.

Singularity theory is a broad subject with vague boundaries. It draws on many other areas of mathematics, and in turn has contributed to many areas both within and outside mathematics, in particular differential and algebraic geometry, knot theory, differential equations, bifurcation theory, Hamiltonian mechanics, optics, robotics and computer vision. This volume consists of two dozen articles from some of the best known figures in singularity theory, and it presents an up-to-date survey of research in this area.

William M. GOLDMAN. — **Complex hyperbolic geometry.** — Oxford mathematical monographs. — Un vol. relié, 16×24, de XX, 316 p. — ISBN 0-19-853793-X. — Prix: £65.00. — Clarendon Press, Oxford, 1999.

From the preface: This book attempts a fairly comprehensive treatment of the geometry of complex hyperbolic space and its boundary. This subject's richness is enhanced by the confluence of many fields of mathematics: Riemannian geometry, complex analysis, symplectic and contact geometry, Lie theory, harmonic analysis and ergodic theory. The boundary of complex hyperbolic geometry is spherical CR geometry or *Heisenberg geometry*... Largely motivated by applications to geometric structures, moduli spaces and discrete groups, this book does not attempt a thorough discussion of any of these topics. Nor does it attempt a thorough treatment of the analytic aspects listed above. Instead, this book is a user's guide to complex hyperbolic geometry...

Emmanuel HEBEY. — **Nonlinear analysis on manifolds: Sobolev spaces and inequalities.** — Courant lecture notes, vol. 5. — Un vol. broché, 15×22,5, de 309 p. — ISBN 0-9658703-4-0. — Prix: US$20.00. — Courant Institute of Mathematical Sciences, New York, 1999.

These notes deal with the theory of Sobolev spaces on Riemannian manifolds. The present notes are organized into nine chapters. Chapter 1 is a quick introduction to differential and

Riemannian geometry. Chapter 2 deals with the general theory of Sobolev spaces for compact manifolds, while Chapter 3 deals with the general theory of Sobolev spaces for complete, non-compact manifolds. Best constants problems for compact manifolds are discussed in Chapters 4 and 5, while Chapter 6 deals with some special type of Sobolev inequalities under constraints. Best constants problems for complete noncompact manifolds are discussed in Chapter 7. Chapter 8 deals with Euclidean-type Sobolev inequalities. The influence of symmetries on Sobolev embeddings is discussed in Chapter 9.

N.J. HITCHIN, G.B. SEGAL, R.S. WARD. — **Integrable systems: twistors, loop groups, and Riemann surfaces.** — Based on lectures given at a conference on Integrable Systems organized by N.M.J. Woodhouse and held at the Mathematical Institute, University of Oxford, in September 1997. — Un vol. relié, 16×24, de VIII, 136 p. — ISBN 0-19-850421-7. — Prix: £25.00. — Clarendon Press, Oxford, 1999.

The introduction by N. Hitchin addresses the meaning of integrability: how do we recognize an integrable system? His own contribution then develops connections with algebraic geometry, and includes an introduction to Riemann surfaces, sheaves, and line bundles. G. Segal takes the Korteweg-de Vries and nonlinear Schrödinger equations as central examples, and explores the mathematical structures underlying the inverse scattering transform. He explains the roles of loop groups, the Grassmannian, and algebraic curves. R. Ward explores the connection between integrability and the self dual Yang-Mills equations, and describes the correspondence between solutions to integrable equations and holomorphic vector bundles over twistor space.

Serge LANG. — **Fundamentals of differential geometry.** — Graduate texts in mathematics, vol. 191. — Un vol. relié, 16,5×24, de XVII, 535 p. — ISBN 0-387-98593-X. — Prix: DM 109.00. — Springer, New York, 1999.

This is the new edition of Serge Lang's *Differential and Riemannian Manifolds*. It provides an introduction to basic concepts in differential topology, differential geometry, and differential equations, and some of the main basic theorems in all three areas: for instance, the existence, uniqueness, and smoothness theorems for differential equations and the flow of a vector field; the basic theory of vector bundles including the existence of tubular neighborhoods for a submanifold; the calculus of differential forms; basic notions of symplectic manifolds, including the canonical 2-form; sprays and covariant derivatives for Riemannian and pseudo-Riemannian manifolds; applications to the exponential map, including the Cartan-Hadamard theorem and the first basic theorem of calculus of variations.

John MADORE. — **An introduction to noncommutative differential geometry and its physical applications.** — Second edition. — London Mathematical Society lecture note series, vol. 257. — Un vol. broché, 15,5×23, de VI, 321 p. — ISBN 0-521-65991-4. — Prix: £24.95. — Cambridge University Press, Cambridge, 1999.

A significant amount of the differential structure of a smooth manifold can be encoded in the algebra of smooth functions defined on it. A noncommutative geometry is what one obtains when one replaces this algebra by a noncommutative associative algebra. A more or less complete survey of this geometry is given as well as some possible applications to elementary particle physics and field theory. The first edition of this book arose from the 1994 LMS invited lectures. This second edition is thoroughly revised and includes new material on reality conditions and linear connections plus examples from Jordanian deformations and quantum Euclidean spaces and assumes only some familiarity with ordinary differential geometry and the theory of fibre bundles.

Andrei MARSHAKOV. — **Seiberg-Witten theory and integrable systems.** — Un vol. broché, 15,5×22, de 253 p. — ISBN 981-02-3637-9. — Prix: £16.00. — World Scientific, Singapore, 1999.

SUSY Yang-Mills theories. — Integrable systems. — Integrable equations in 2D topological string theories. — The Seiberg-Witten Ansatz. Generating differential and Whitham hierarchy. — Prepotential of the Seiberg-Witten theory. — Seiberg-Witten theory from strings. — Appendices: Riemann surfaces and theta-functions. KP hierarchy and theory of free fermions. Residue formula for the $N = 2$ Calogero-Moser system. Algebra of differentials for the Calogero-Moser system. Explicit derivation in elliptic case.

A. STASIAK, V. KATRITCH, L.H. KAUFFMAN, (Editors). — **Ideal knots.** — Series on knots and everything, vol. 19. — Un vol. relié, 16×22,5, de X, 414 p. — ISBN 981-02-3530-5. — Prix: £31.00. — World Scientific, Singapore, 1998.

In this book, experts in different fields of mathematics, physics, chemistry and biology present unique forms of knots which satisfy certain preassigned criteria relevant to a given field. They discuss the shapes of knotted magnetic flux lines, the forms of knotted arrangements of bistable chemical systems, the trajectories of knotted solitons, and the shapes of knots which can be tied using the shortest piece of elastic rope with a constant diameter. — *Contents:* Ideal knots and their relation to the physics of real knots (A. Stasiak et al.), Knots with minimal energies (Y. Diao et al.), The writhe of knots and links (E. J. Janse van Rensburg et al.), Entropy of a knot: simple arguments about difficult problem (A. Yu. Grosberg), Knots and fluid dynamics (H. K. Moffatt), Möbius-invariant knot energies (R. B. Kusner & J. M. Sullivan), Fourier knots (L. H. Kauffman), and other papers.

Probabilités et processus stochastiques

Rodrigo BAÑUELOS, Charles N. MOORE. — **Probabilistic behavior of harmonic functions.** — Progress in mathematics, vol. 175. — Un vol. relié, 16×24, de XIV, 204 p. — ISBN 3-7643-60602-3. — Prix: SFr. 98.00. — Birkhäuser, Basel, 1999.

The primary focus of the text is the nontangential maximal function and the area function of a harmonic function and their probabilistic analogues in martingale theory. The text first gives the requisite background material from harmonic analysis and discusses known results concerning the nontangential maximal function and area function, as well as the central and essential role these have played in the development of the field. The book next discusses further refinements of traditional results: among these are sharp good-lambda inequalities and laws of the iterated logarithm involving nontangential maximal functions and area functions. Many applications of these results are given.

Hans CRAUEL, Matthias GUNDLACH, (Editors). — **Stochastic dynamics.** — Un vol. relié, 16×24, de XVII, 440 p. — ISBN 0-387-98512-3. — Prix: DM 129.00. — Springer, New York, 1999.

This volume gives an account of new and recent developments in the theory of random and, in particular, stochastic dynamical systems. Its purpose is to document and, to some extent, summarize the current state of the field of random dynamical systems beyond the recent monograph *Random Dynamical Systems* by Ludwig Arnold. Recent results on stochastic bifurcation, hyperbolic systems, numerics and asymptotics, more general driving processes for stochastic differential equations, and stochastic analysis on infinite-dimensional manifolds are presented in a comprehensible manner. Several new and exciting insights into the unexpected variety of dynamical behaviors resulting from influence of stochastic perturbations are conveyed to the reader.