

# Géométrie

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concentrate on Hilbert spaces, specifically the spectral theorem for bounded as well as unbounded operators in separable Hilbert spaces. While the first two chapters are devoted to basic propositions concerning normed vector spaces and Hilbert spaces, the third chapter treats advanced topics which are perhaps not standard in a first course on functional analysis (a detour into operator algebras). The fourth chapter reverts to more standard operator theory in Hilbert space, dwelling on topics such as the spectral theorem for normal operators, the polar decomposition theorem, and the Fredholm theory for compact operators.

## *Calcul des variations*

Andrea BRAIDES, Anneliese DEFRANCESCHI. — **Homogenization of multiple integrals.** — Oxford lecture series in mathematics and its applications, vol. 12. — Un vol. relié, 16,5×24, de xiv, 298 p. — ISBN 0-19-850246-X. — Prix: £40.00. — Clarendon Press, Oxford, 1998.

Homogenization results and appropriate descriptive formulae are given for periodic and almost periodic functionals. Applications are described to the asymptotic behaviour of oscillating energies describing cellular hyperelastic materials, porous media, materials with stiff and soft inclusions, and fibred media; to homogenization of Hamilton-Jacobi equations and Riemannian metrics, and to materials with multiple scales of microstructure and with multi-dimensional structure. There is a self-contained and up-to-date introduction to the relevant results of the direct methods of  $\Gamma$ -convergence and of the theory of weak lower semi-continuous integral functions that depend on vector-valued functions.

Jürgen JOST, Xianqing LI-JOST. — **Calculus of variations.** — Cambridge studies in advanced mathematics, vol. 64. — Un vol. relié, 16×23,5, de xvi, 323 p. — ISBN 0-521-64203-5. — Prix: £37.50. — Cambridge University Press, Cambridge, 1999.

One-dimensional problems and classical issues like Euler-Lagrange equations are treated, as are Noether's theorem, Hamilton-Jacobi theory, and in particular geodesic lines, thereby developing some important geometric and topological aspects. The basic ideas of optimal control theory are also given. The second part of the book deals with multiple integrals. After a review of Lebesgue integration, Banach and Hilbert space theory and Sobolev spaces (with complete details and proofs), there is a treatment of the direct methods and the fundamental lower semi-continuity theorems. Subsequent chapters introduce the basic concepts of the modern calculus of variations, namely relaxation, Gamma convergence, bifurcation theory and minimax methods based on the Palais-Smale condition.

## *Géométrie*

Jack B. KUIPERS. — **Quaternions and rotation sequences: a primer with applications to orbits, aerospace, and virtual reality.** — Un vol. relié, 20×26, de xxii, 371 p. — ISBN 0-691-05872-5. — Prix: £35.00. — Princeton University Press, Princeton, distributed by John Wiley & Sons, Chichester, 1999.

In this book, the author introduces quaternions for scientists and engineers who have not encountered them before and shows how they can be used in a variety of practical situations. The opening chapters present introductory material and establish the book's terminology and notation. The next part presents the mathematical properties of quaternions, including quaternion algebra and geometry. It includes more advanced special topics in spherical trigonometry, along with an introduction to quaternion calculus and perturbation theory. In the final section, the author discusses state-of-the-art applications.

Robin J.Y. McLEOD, M. Louisa BAART. — **Geometry and interpolation of curves and surfaces.** — Un vol. relié, 16×23,5, de XIV, 414 p. — ISBN 0-521-32153-0. — Prix: £50.00. — Cambridge University Press Cambridge, 1998.

The authors start with simple interpolation, including splines. They extend these simple procedures to the production of conic sections and then introduce projective coordinates as tools for dealing with higher-order curves and such important concepts as singular points. They present many applications and concrete examples, including an analysis of the rational and polynomial cubics, parabolic interpolation, geometric approximation, and the numerical solution of trajectory problems. In the final chapter they apply the basic theory to the construction of finite-element basis functions and surface interpolants over nonregular shapes and discuss the simple cases of the Steiner surface and the cubic surface.

Burkard POLSTER. — **A geometrical picture book.** — Universitext. — Un vol. relié, 16,5×24,5, de XX, 291 p. — ISBN 0-387-98437-2. — Prix: DM 98.00. — Springer, New York, 1998.

Pictures are what this book is all about; original pictures of everybody's favorite geometries such as configurations, projective planes and spaces, circle planes, generalized polygons, mathematical biplanes, and other designs which capture much of the beauty, construction principles, particularities, substructures, and interconnections of these geometries. This guided tour includes lots of stereograms of the spatial models, games and puzzles and instructions on how to construct your own pictures and build some of the spatial models yourself.

Hendrik VAN MALDEGHEM. — **Generalized polygons.** — Monographs in mathematics, vol. 93. — Un vol. relié, 17,5×24, de xv, 502 p. — ISBN 3-7643-5864-5. — Prix: SFr. 178.00. — Birkhäuser Verlag, Basel, 1998.

This book is the first book to cover, in a coherent manner, the theory of polygons from scratch. In particular, it fills elementary gaps in the literature and gives an up-to-date account of current research in this area, including most proofs, which are often unified and streamlined in comparison to the versions generally known. The approach taken in the book is of geometric nature, but algebraic results are included and proven (in a geometric way). A noteworthy feature is that the book unifies and generalizes notions, definitions and results that exist for quadrangles, hexagons, octagons — in the literature very often considered separately — to polygons.

## *Géométrie différentielle*

Thierry AUBIN. — **Some nonlinear problems in Riemannian geometry.** — Springer monographs in mathematics. — Un vol. relié, 16,5×24,5, de xvii, 395 p. — ISBN 3-540-60752-8. — Prix: DM 168.00. — Springer, Berlin, 1998.

During the last few years, the field of nonlinear problems has undergone great development. This book, the core of which is the content of the author's earlier book (Springer 1983), updated and extended in each chapter, and augmented by several completely new chapters, deals with some important geometric problems that have only recently been solved or partially solved. Each problem is explained with the present status of its solution and the most recent methods of approaching the proofs. The main aim is to explain some methods and new techniques, and to apply them to problems coming from geometry or from physics.