Recent books

edited by Ivan Netuka and Vladimír Souček (Prague)

M. Anderson, V. Katz, R. Wilson: ***Sherlock Holmes in Babylon and Other Tales of Mathematical History,*** *Spectrum, The Mathematical Association of America, Washington, 2003, 420 pp., $49,95, ISBN 0-88385-546-1*
This excellent book contains 44 articles on the history of mathematics, which were published in journals of the Mathematical Association of America (American Mathematical Monthly, College Mathematics Journal, Mathematics Magazine, National Mathematics Magazine) over the past 100 years. The articles were written by distinguished past historians of mathematics (e.g., F. Cajori, J. L. Coolidge, M. Dehn, D. E. Smith, C. Boyer) as well as some contemporary ones (including E. Robson, R. Creighton Buck, V. Katz). The articles are divided into four sections (Ancient mathematics, Medieval and renaissance mathematics, The seventeenth century, The eighteenth century) and they cover almost 4000 years (from the ancient Babylonians to the development of mathematics in the eighteenth century). The most interesting topics from Babylonian, Greek, Roman, Chinese, Indian as well as European mathematics are included. Each section is preceded by a Foreword, containing comments on historical context, and followed by an Afterword. In some cases, two articles on the same topic are included showing the progress in the history of mathematics. The comparison shows that although modern research brings new information and new interpretations, the older papers are neither dated nor obsolete. The book is not a classical textbook of the history of mathematics; the topics included do not cover the whole development of mathematics. The book can be recommended to everybody interested in the history of mathematics and to anybody who loves mathematics. (mnem)

R. Arratia, A.D. Barbour, S. Tavaré: ***Logarithmic Combinatorial Structures: A Probabilistic Approach,*** *EMS Monographs in Mathematics, vol. 1, European Mathematical Society, Zürich, 2003, 375 pp., €69, ISBN 3-03719-000-0*
Many combinatorial (and other) objects can be decomposed into connected components and one can be interested in numbers and sizes of components in a random object. In this monograph, strong results are derived for the component frequency spectrum in a rather general probabilistic situation, which is determined by two conditions (axioms): the conditioning relation and the logarithmic condition. In chapter 1, the decomposition of permutations to cycles and the decomposition of integers to primes are compared and in chapter 2, many more examples of combinatorial structures and their decompositions are presented. In the remaining eleven chapters, the authors build an abstract probabilistic approach to the problem of estimation of the component frequency spectrum. Techniques and notions used include the Wasserstein distance, the Stein method, the Ewens sampling formula, size biasing, the scale invariant Poisson process, the GEM distribution and the Poisson-Dirichlet distribution. In the final chapters, the treatise becomes technical but the reader is rewarded by strength and generality of obtained theorems. (mkl)

A. Arvanitoyeorgos: ***An Introduction to Lie Groups and the Geometry of Homogeneous Spaces,*** *Student Mathematical Library, vol. 22, American Mathematical Society, Providence, 2003, 141 pp., $29, ISBN 0-8218-2778-2*
The main topics treated in this small book are semisimple Lie groups, homogeneous spaces and their geometry, invariant metrics, symmetric spaces and generalized flag manifolds. The book starts with the definition of a Lie group and its associated Lie algebra, together with a simple version of Lie theorems. A study of the Killing form leads to the notion of a semisimple Lie algebra. To equip Lie groups with a structure of a Riemannian manifold, bi-invariant metrics are introduced, together with the associated connections and expressions for their curvature. Homogeneous spaces are introduced and their Riemannian structure is defined by means of G-invariant metrics. Two basic classes of examples - symmetric spaces and generalized flag manifolds - are classified. The last chapter contains some applications to physics (homogeneous Einstein and Kähler-Einstein metrics, Hamiltonian systems on generalized flag manifolds and homogeneous geodesics). Notions introduced in the book are nicely illustrated by a lot of examples. The size of the book is very small but it contains a wealth of interesting material. (vs)

M. Audin, A.C. da Silva, E. Lerman***: Symplectic Geometry of Integrable Hamiltonian Systems,*** *Advanced Courses in Mathematics CRM Barcelona, Birkhäuser, Basel, 2003, 225 pp., €28, ISBN 3-7643-2167-9*
The three contributions contained in the book are based on lectures given by the authors at the Euro Summer School "Symplectic geometry of integrable Hamitonian systems", held in Barcelona in July 2001. The first paper (by M. Audin) contains a discussion of special Lagrangian submanifolds. This notion was studied very intensively during recent years in connection with integrable systems and, in particular, with string theory and the mirror symmetry. Special Lagrangian submanifolds are rare beings, hard to construct, and their moduli space is finite dimensional. In the paper, explicit examples of special Lagrangian submanifolds are constructed and the moduli space of special Lagrangian submanifolds of a Calabi-Yau manifold is discussed. The second paper (by A. C. da Silva) contains an introduction to toric manifolds using the moment map and the moment polytope as the main tools. The text has two parts. The first part uses a classification of equivalence classes of symplectic toric manifolds, using their moment polytopes, and a computation of homology of symplectic toric manifolds using the Morse theory. The second part considers toric manifolds in algebraic geometry and it has a structure parallel to the first part. The third contribution (by E. Lerman) is devoted to the following problem: Let M be the cotangent bundle of an n-dimensional torus without the zero section. Suppose that there is an effective action of the group $G=R^n/Z^n$ on M, preserving the standard symplectic structure on M and commuting with dilations. Is the action of G necessarily free? To answer the question, contact toric manifolds are introduced, and contact moment maps are used together with the Morse theory on orbifolds. The three sets of lectures complement each other nicely and the book offers a very useful and systematic introduction to a modern and interdisciplinary field. (vs)

C. Bardaro, J. Musielak, G. Vinti: ***Nonlinear Integral Operators and Applications,*** *de Gruyter Series in Nonlinear Analysis and Applications 9, Walter de Gruyter, Berlin, 2003, 201 pp., €88, ISBN 3-11-017551-7*
The book is devoted to quite general approximation methods based on convolution operators (both linear and nonlinear) and to the study of such operators. In order to develop the right setting for this investigation, the first two chapters contain preliminary results on modular spaces, which are a suitable generalization of the Orlicz spaces as well as of spaces with bounded φ-variation. The following two chapters present some error estimates of approximations in terms of moduli of continuity. Classical linear convolution operators are generalized here to nonlinear convolutions with kernels, which either satisfy Lipschitz-type conditions or are homogeneous in the generalised sense. Applications to the summability problem of a family of functions are given in Chapter 5. The convergence of approximations in φ-variation is possible only in certain subspaces of functions of bounded φ-variation. These subspaces are studied in Chapter 6. Two basic fixed-point theorems are used in Chapter 7 to obtain solutions of nonlinear convolution equations. There is an important application of interpolations to the so-called sampling theorem in signal analysis. The classical linear interpolation methods can be replaced by nonlinear ones. Results in this direction for several classes of signals are shown in the last two chapters. The book, based mainly on results from the authors, can be considered as a nonlinear continuation of the classical book of P. L. Butzer and R. J. Nickel (Fourier Analysis and Approximation, Academic Press, 1971). The presentation is clear and self-contained so that the book can be recommended not only to researchers in approximation theory but to graduate students as well. (jmil)

H.-J. Baues: ***The Homotopy Category of Simply Connected 4-Manifolds,*** *London Mathematical Society Lecture Note Series 297, Cambridge University Press, Cambridge, 2003, 184 pp., £24,95, ISBN 0-521-53103-9*
The main aim of this book is to understand the category of simply connected closed topological 4-manifolds and the homotopy classes of mappings between them. It is necessary to mention that the problem consisted especially in the description of the homotopy classes of maps. As an important tool the author uses the category **CW**(2,4). Its objects are CW-complexes X with one 0-cell, and then with cells only in dimension 2 and 4, and its morphisms are homotopy classes of mappings. Within this category we find the above-mentioned manifolds in the sense that every simply connected 4-manifold is homotopy equivalent with such a CW-complex X with only one 4-cell. The main achievement of the book is a construction of a purely algebraic category, which is equivalent to the category **CW**(2,4). This, of course, enables the transform from various topological considerations into an algebraic setting. The advantage of such a transformation is obvious. The subject of the book is relatively special, and this naturally brings the necessity of special procedures and special computations. Therefore the reader may have an impression that the text is rather technical. This is not at all true. On the contrary, the reader will obtain very deep information on the structure of relevant categories. The text is very clearly written but the author substantially uses many previous results of his own as well as many other results. This means that the reading is not very easy. Nevertheless, the results are so excellent that they deserve some patience and effort. (jiva)

M. A. Bennet, B. C. Berndt, N. Boston, H. G. Diamond, A. J. Hildebrand, W. Philips, (Eds.): ***Number Theory for the Millennium,*** *I, A. K. Peters, Natick, 2002, 461 pp., $50, ISBN 1-56881-126-8*
M. A. Bennet, B. C. Berndt, N. Boston, H. G. Diamond, A. J. Hildebrand, W. Philips, (Eds.): ***Number Theory for the Millennium, II,*** *A. K. Peters, Natick, 2002, 447 pp., $50, ISBN 1-56881-146-2*
M. A. Bennet, B. C. Berndt, N. Boston, H. G. Diamond, A. J. Hildebrand, W. Philips, (Eds.): ***Number Theory for the Millennium, III,*** *A. K. Peters, Natick, 2002, 450 pp., $50, ISBN 1-56881-152-7*
This three volume collection of papers contains more than 1300 pages with 72 talks given at the Millennial Conference on Number Theory, which was held at the campus of the University of Illinois at Urbana-Champaign in May 2000. The papers cover the wide range of contemporary number theory. The conference was one of the most important international meetings devoted to number theory, framed by 175 talks. Consequently the interested reader finds here not only surveys on the most important contributions to number theory and its applications, but also surveys on methods and techniques used in this important branch of mathematics. The collection offers a respectable view on contemporary number theory given by prominent number theorists, and therefore could be recommended not only to number theorists but generally to all mathematicians interested in various aspects of number theory. (špo)

S. Bezuglyi, S. Kolyada, Eds.: ***Topics in Dynamics and Ergodic Theory,*** *London Mathematical Society Lecture Note Series 310, Cambridge University Press, Cambridge, 2003, 270 pp., £30, ISBN 0-521-53365-1*
The volume collects some of the mini-courses presented at the International Conference and US-Ukrainian Workshop "Dynamical Systems and Ergodic Theory", held in Katsiveli (Crimea, Ukraine) in August 2000. The introductory contribution by A. M. Stepin is devoted to the memory of V. M. Alexeyev, one of the best lecturers of the Katsiveli's school, who died in 1980 at the age of 48. The paper "Minimal idempotents and ergodic Ramsey theorems", by V. Bergelson, reviews the construction of the Stone-Čech compactification βN of N as the Ellis enveloping semigroup of the map $\sigma = x+1$ on N. Using minimal idempotents, the celebrated van der Waerden theorem on arithmetic progressions is proved. In "Symbolic dynamics and topological models in dimensions 1 and 2", A. de Carvalho and T. Hall present the classical kneading theory of unimodal systems and extend it to two-dimensional systems like the horseshoe. In "Markov odometers", A. H. Dooley proves that every ergodic non-singular transformation is orbit equivalent to a Markov odometer on a Bratteli-

Vershik system. In "Geometric proofs of Mather's connecting and accelerating theorems", V. Kaloshin treats the wandering trajectories of exact area preserving twist maps. In "Structural stability in 1D dynamics", O. Kozlovski treats the structural stability in spaces of smooth and analytic maps. In "Periodic points of nonexpansive maps: a survey", B. Lemmas shows that trajectories of nonexpansive maps converge to periodic orbits. In "Arithmetic dynamics", N. Sidorov deals with explicit arithmetic expansions of reals and vectors that have a dynamical sense. In "Actions of amenable groups", B. Weiss generalizes much of the classical ergodic theory to general amenable groups like Z^n; in particular he proves the Shannon-McMillan theorem. (pku)

N. Bourbaki: ***Elements of Mathematics. Integration I. Chapters 1-6,*** *Springer, Berlin, 2004, 472 pp., €99,95, ISBN 3-540-41129-1*

Bourbaki, a collective author in the sixties, wrote the series of books 'Elements of Mathematics'. This is an English translation of the well-known original French edition. It contains the first six chapters (of nine) from the part devoted to integration. As in all books in the series, presentation of material is abstract, proceeding from general to particular. Therefore a good knowledge of an undergraduate course seems to be almost necessary. The approach to the integration theory here is functional, based on the notion of a measure as a continuous linear functional on the space of real, or complex, continuous functions with compact support in a locally compact topological space. The six chapters cover a detailed exposition of results on extension of measures. The chapter on integration of measures includes the Lebesgue-Fubini theorem, the Lebesgue-Nikodým theorem, and results on disintegration of measures. An essential part of the theory of L^p spaces is also covered. The presentation of vector-valued integration is based on the weak integral. The text contains full proofs of the stated results, many exercises, and worthwhile historical notes. It is written very carefully to prevent misunderstandings and to make orientation in the text easy. (ph)

D. Cerveau, E. Ghys, N. Sibony, J.-Ch. Yoccoz: ***Complex Dynamics and Geometry,*** *SMF/AMS Texts and Monographs, vol. 10, American Mathematical Society, Société Mathématique de France, Providence, 2003, 197 pp., $59, ISBN 0-8218-3228-X*

The book contains four survey papers on different but closely related topics in the theory of holomorphic dynamical systems. The first paper (by D. Cerveau) is devoted to a study of codimension 1-holomorphic foliations. The main tool used here is a reduction of singularities. Particular attention is devoted to foliations in dimensions two and three. The paper ends with applications to the singular Frobenius theorem and a discussion of invariant hypersurfaces. The second paper (by E. Ghys) contains a discussion of Riemann surface laminations, arising in the theory of holomorphic dynamical systems. The Riemann surface laminations are more general objects than ordinary foliations, the ambient space need not have a structure of a manifold. Their leaves are (not necessarily compact) Riemann surfaces. Classical questions for Riemann surfaces (uniformization, existence of meromorphic functions) are studied in this more general setting. The paper by N. Sibony describes an analogue of the Fatou-Julia theory for a rational map f from $P^k(C)$ to itself. The dynamics of f are described using properties of a suitable closed positive current of bidegree (1,1). The second part is devoted to a study of regular polynomial biholomorphisms of C^k, and the last part to holomorpic endomorphisms of $P^k(C)$. For the convenience of the reader, properties of currents and plurisubharmonic functions are summarized at the end of the paper. The fourth contribution (by J.-C. Yoccoz, written by M. Flexor) describes properties of the simplest nontrivial case of holomorphic dynamics, given by a quadratic polynomial in one complex variable. The discussion is centred around hyperbolic aspects, the Jacobsen theorem and quasiperiodic properties, related to problems of small divisors. The whole book starts with an introductory paper on holomorphic dynamics (written by E. Ghys). It contains many interesting comments on the historical evolution of the discussed topics and their mutual relations. (vs)

J. W. Cogdell, H. H. Kim, M. R. Murty: ***Lectures on Automorphic L-functions,*** *Fields Institute Monographs, American Mathematical Society, Providence, 2004, 283 pp., $63, ISBN 0-8218-3516-5*

This book consists of lecture notes from three graduate courses given at the special program on authomorphic forms at the Fields Institute in the spring of 2003. The course by Cogdell is an introduction to standard L-functions of automorphic forms on GL(n) and the Rankin-Selberg L-functions on GL(m) x GL(n). It covers the following topics: Whittaker models, local and global functional equations, converse theorems and functorial lifts for classical groups. The course by Kim is a survey of the Langlands–Shahidi approach to L-functions via constant terms of Eisenstein series. It culminates in the recent proofs of functoriality of the symmetric cube and fourth for GL(2). The course by Ram Murty centers on analytic properties of automorphic L-functions and their applications to estimates for Hecke (and Laplace) eigenvalues. This book is a wonderful introduction to the Langlands program. It is heartily recommended to students (and researchers) specializing in number theory and related areas. (jnek)

J. K. Davidson, K. H. Hunt: ***Robots and Screw Theory. Application of Kinematics and Statistics to Robotics,*** *Oxford University Press, Oxford, 2004, 476 pp., £85, ISBN 0-19-856245-4*

This monograph can be regarded as a comprehensive textbook on applications of screw theory in a variety of situations in mechanics and robotics. Special attention is paid to modern applications of screws in the robotics of both serial and parallel manipulators. A screw is defined either as a pair of a force and a couple (a wrench) or as an infinitesimal space motion (twist). Later on, the connection to the vector field of velocities of a spatial motion and to the instantaneous motion is described. The basic properties of screws are described in chapter 3, including screw (Plücker) coordinates. The next three chapters deal with coordinate transformations, screw systems and reciprocity (duality) of twists and wrenches. Properties of serial robot manipulators are studied in chapters 6 and 7, including many examples of commercially used robots. Chapters 7 and 8 are devoted to parallel robot-manipulators and their basic geometric properties, including the Jacobian and its computation. Special attention is given to the 3-3 parallel manipulator - the octahedral structure. The rest of the book concentrates on more advanced topics, for instance on manipulators combining serial and parallel structures, redundant robotic systems and legged vehicles. Appendices give some useful formulas from line geometry and basic ideas of the projective representation of screws in connection with the projective line geometry. The Study representation is mentioned at the very end. The book contains useful historical remarks on the origins of screw theory and related topics, references contain not only historical sources on the subject but also recent publications relevant to considered problems. The main point of the book lies in applications of screws and not much space is devoted to the theory. This means that no proofs are given, the algebraic structure of the screw space is not emphasized and the style of the book is traditional. It can be recommended to all engineers and postgraduate students doing research in complicated mechanical systems, in particular in the mechanics of serial and parallel robot manipulators. (ak)

M. Emerton, M. Kisin: ***The Riemann-Hilbert Correspondence for Unit F-Crystals,*** *Astérisque 293, Société Mathématique de France, Paris, 2004, 257 pp., €57, ISBN 2-85629-154-6*

If k is a perfect field of characteristic $p > 0$ and X a smooth $W_n(k)$-scheme, a well known generalization of the Artin–Schreier theory (due to N. Katz) establishes an equivalent of categories between locally free étale sheaves of Z/p_nZ –modules on X and vector bundles E on X satisfying $F^*R \cong E$ (where F is a lift of the Frobenius to X). The main goal of the book is to generalize this result to a Riemann-Hilbert type correspondence between the derived category $D^b_{ctf}(X_{et}, Z/p_nZ)$ and a certain triangulated category of arithmetic D–modules equipped with an action of Frobenius. In fact, the case n=1 is treated separately, as it does not require any differential operators (nor the perfectness of k). (jnek)

L. Fargues, E. Mantovan: ***Variétés de Shimura espaces de Rapoport-Zink et correspondances de Langlands locales,*** *Astérisque 291, Société Mathématique de France, Paris, 2004, 331 pp., €66, ISBN 2-85629-150-3*

This volume contains two articles that generalize some aspects of the recent work of M. Harris and R. Taylor on cohomology of certain unitary Shimura varieties and associated moduli space of p-divisible groups. As the authors consider unitary groups of more general signature, they have to get around the fact that one can no longer use Drinfeld bases to define nice integral models of the relevant moduli spaces. Instead, the authors work with the corresponding rigid analytic spaces defined by M. Rapoport and T. Zink. In the first article, L Fargues shows that one can realize the local Langlands correspondence (in the supercuspidal case) in the étale cohomology of certain Rapoport–Zink spaces. In the second article, E. Mantovan series uses the Newton–polygon stratification of the special fibre of the Shimura variety to relate its cohomology to the cohomology of the associated Rapoport–Zink spaces and generalized Igusa varieties. (jnek)

G. N. Frederickson: ***Dissections: Plane and Fancy,*** *Cambridge University Press, Cambridge, 2003, 310 pp., £16,95, ISBN 0-521-57197-9, ISBN 0-521-52582-9*

The book by Frederickson on recreational mathematics is devoted to the problem of how to cut a square (or triangle or hexagon) into the smallest number of pieces and how to rearrange them into two squares (or triangles or hexagons). The book also deals with others figures, e.g. stars, Maltese Crosses, and with solids (polyhedra). Martin Gardner, a well-known expert in recreational mathematics, can be considered the unofficial godfather of the book. Even great mathematicians were interested in dissections. In 1900, David Hilbert presented the famous wide-ranging list of twenty-three problems and a third of them dealt with dissections of polyhedra (the negative result proposed by him was proven by M. Dehn within a few months). The reader will find solutions to all problems contained at the end of the book. The bibliography is very comprehensive. A basic knowledge of high school geometry is sufficient for reading the book. Every puzzle fan will like this interesting and amusing book. (lboc)

F. Gesztesy, H. Holden: ***Soliton Equations and Their Algebro-Geometric Solutions, vol. I: (1+1)-Dimensional Continuous Models,*** *Cambridge Studies in Advanced Mathematics 79, Cambridge University Press, Cambridge, 2003, 505 pp., £65, ISBN 0-521-75307-4*

The field of completely integrable systems has developed enormously in the last decades. The book under review covers a part of this broad landscape. Its aim is to discuss in detail algebro-geometric solutions of five hierarchies of integrable nonlinear equations. The presented class of solutions form a natural extension of the classes of soliton and rational solutions, and can be used to approximate more general solutions (e.g. almost periodic ones). Basic tools in the description are spectral analysis and basic theory of compact Riemann surfaces and their theta functions. The basic KdV hierarchy is the most famous case, it contains the equation for solitary waves on channels, which were discovered by Scott Russell in 1834. The solutions of the KdV hierarchy are discussed in the first chapter. The discussion is presented in more detail for this first case than in the other four cases. The second hierarchy treated in Chapter 2 is a combined sine-Gordon and modified Korteweg-de Vries hierarchy. The third chapter contains a discussion of solutions of the AKNS (Ablowitz, Kaup, Newell, Segur) system and related classical Boussinesq hierarchies. The classical massive Thirring system is treated in Chapter 4. The last chapter describes solutions of the Camassa-Holm hierarchy. Individual chapters are organized in such a way that they can be read independently. To reach this goal, similar arguments in constructions are repeated in individual cases. Each chapter ends with detailed notes (e.g. notes for the first chapter have 17 pages) with references to literature, comments and additional results. In the Appendix (140 pages), it is possible to find a summary of many fields (e.g. algebraic curves, theta functions, the Lagrange interpolation, symmetric functions, trace formulae, elliptic functions, spectral measures), which are used in the main chapters. At the end, the reader can find an extensive bibliography (30 pages of references). The book is very well organized and carefully written. It could be particularly useful for analysts wanting to learn new methods coming from algebraic geometry. (vs)

V. I. Gromak, I. Laine, S. Shimomura: ***Painlevé Differential Equations in the Complex Plane,*** *de Gruyter Studies in Mathematics 28, Walter de Gruyter, Berlin, 2002, 299 pp., €88, ISBN 3-11-017379-4*

At the beginning of the 20th century, Painlevé studied properties of second order differential equations in the complex plane and isolated a certain number of equations with distinguished behaviour. Their solutions have the property that there are no movable singularities other than poles. Later on, attention has concentrated to six equations P_1, …, P_6 of Painlevé type with the most interesting properties. The book is devoted to them. In the first chapter, the authors show that the equations P_1, P_2, P_4 and modifications of equations P_3 and P_5 have meromorphic solutions only (with proofs in the first three cases). The growth properties of solutions of these 5 types of equations together with the value distribution theory for them are studied in the next two chapters. The next six chapters are devoted to a study of the properties of solutions of six Painlevé equations. Behaviour of solutions in a neighbourhood of a singularity is studied. Integrable (systems of) equations usually come in whole hierarchies. Higher order analogues of the Painlevé equations of the first two types are discussed in the book. For specific values of parameters of the equations, solutions can be constructed using the Bäcklund transformations. For these values of parameters, solutions can be expressed in terms of rational functions or classical transcendental functions. Relations of the Painlevé equations to hierarchies of integrable systems (KdV, Boussinesq, sine-Gordon, nonlinear Schrödinger, Einstein and Toda type equations) are discussed in the last chapter. The two appendices offer a summary of basic facts needed about solutions of ordinary differential equations in the complex plane and on the Nevanlinna theory. Interest in properties of solutions of Painlevé equations is steadily growing and they appear in many questions in mathematics and mathematical physics. Hence, the careful treatment of them in the presented monograph is a valuable addition to the existing literature. (vs)

A. Grothendieck, Ed.: ***Revêtements étales et groupe fondamental (SGA 1),*** *Documents Mathématiques 3, Société Mathématique de France, Paris, 2003, 325 pp., ISBN 2-85629-141-4*

This is a new edition of the first volume of A. Grothendieck's SGA (Séminaire de géométrie algébrique), which is devoted to the theory of the algebraic fundamental group. The book incorporates a few minor corrections and several updating remarks by M. Raynaud. A TEX file of this text (as well as of the uncorrected version), typeset by a team of volunteers headed by S. Edixhoven, is available from the arXiv.org e-print server. This book is indispensable to any serious student of algebraic geometry. (jnek)

B. Hasselblatt, A. Katok: ***A First Course in Dynamics: with a Panorama of Recent Developments,*** *Cambridge University Press, Cambridge, 2003, 424 pp., £25,95, ISBN 0-521-58750-6, ISBN 0-521-58304-7*

The book has two parts. The first one (A Course in Dynamics: From Simple to Complicated Dynamics) can serve as a textbook for a beginner course in dynamical systems for senior undergraduate students of mathematics, physics and engineering. The explanation is slightly unusual, since it is based on a number of simple examples that present basic behaviour of dynamical systems. The outset of theory, including topological and probabilistic methods, begins from the detailed study of these examples. The exposition is accompanied by many valuable comments and exercises of different complexity. The first part ends with complicated orbit structures like recurrence and mixing for systems on a torus. Chaotic behaviour is presented and applications to coding are also given.

The second part (Panorama of Dynamical Systems) is more advanced and is intended as an introduction to modern achievements of the theory. Hyperbolic dynamics is studied, and results like the closing and shadowing lemma are proved. A lot of attention is paid to the classical example of the quadratic map. A mechanism that produces horseshoes and thus gives rise to chaotic dynamics is shown. The famous Lorentz attractor, as a prototype of a strange attractor, is examined in details. Variational approach does not belong to usual tools in dynamical systems. The authors present how this approach can be applied to the study of twist maps and afterwards to Riemann manifolds. The existence of infinitely many closed geodesics on the two-dimensional sphere equipped with a Riemannian metric is proved. The second part ends with the chapter devoted to relations between number theory and dynamical systems. The book is written in a precise and very readable style, there are many useful remarks and figures throughout. It can be highly recommended to anybody who is interested in dynamical systems and who has a basic knowledge of calculus. The book is also an excellent introduction to the more advanced monograph written by the same authors (Introduction to the Modern Theory of Dynamical Systems, Encyclopaedia of mathematics and its applications, vol. 54, Cambridge University Press, 1995). (jmil)

R. M. Heiberger, B. Holland: ***Statistical Analysis and Data Display,*** *Springer Texts in Statistics, Springer, New York, 2004, 729 pp., 200 fig., €79,95, ISBN 0-387-40270-5*

The book is written as a text for a yearlong course in statistics. The importance of such a textbook follows from the fact that today there are more than 15,000 statisticians in the United States only, over 100 U.S. universities offer graduate degrees in statistics and a shortage of qualified statisticians is expected to persist for some time. The students should learn not only purely mathematical tools but also the use of computers for obtaining numerical results and their graphical presentation. The book describes statistical analysis of data and shows how to communicate the results. The topics included in the book are standard ones: an introduction to statistical inference, one-way and two-way analysis of variance, multiple comparisons, simple and multiple linear regression, design of experiments, contingency tables, nonparametrics, logistic regression, and time series analysis in time domain. An "invisible" but extremely important part of the book is a web page (or CD) with the data for all examples and exercises, which also contains codes in S (i.e., S-PLUS and R) and in SAS. In online files, the reader also finds the code and the PostScript file for every figure in the text.

The statistical analysis in the book is taught on interesting real examples. Sometimes (e.g. in logistic regression) the analysis is quite deep. An extraordinary care is devoted to graphical presentation of results. Many of the graphical formats are novel. Finally, appendices to the book contain useful remarks on statistical software, typography, and a review of fundamental mathematical concepts. A reader who studies the book and repeats the authors' calculations gains basic statistical skills and knowledge of software for solving similar problems in applications. The book contains no theorems and no proofs. The methods are only explained and then demonstrated. However, if a statistical course contains a theoretical part, then the book can serve as a source of interesting examples and problems. By the way, the authors' web page also contains errata, which is quite comfortable for the readers. It is surely not a final list of misprints. For example, the median of the binomial distribution with n=2 and p=0.5 is h=1 which does not satisfy condition (3.10) on p. 28. (ja)

T. A. Ivey, J. M. Landsberg: ***Cartan for Beginners: Differential Geometry via Moving Frames and Exterior Differential Systems,*** *Graduate Studies in Mathematics, vol. 61, American Mathematical Society, Providence, 2003,378 pp., $59, ISBN 0-8218-3375-8*

Moving frames and exterior differential systems belong to classical methods for studying geometry and partial differential equations. These ideas emerged at the beginning of the 20th century, being introduced and developed by several mathematicians, in particular, by Élie Cartan. Over the years these techniques have been refined and extended. The book is a nice introduction into classical and recent geometric applications of the techniques. It covers classical geometry of surfaces and basic Riemannian geometry in the language of the method of moving frames; it also includes results from projective differential geometry. There is an elementary introduction to exterior differential systems, basic facts from G-structures and general theory of connections. Every section begins with geometric examples and problems. There are four appendices devoted to linear algebra and representation theory, differential forms, complex structures and complex manifolds and initial value problems. Interesting exercises are included, together with hints and answers to some of them. The authors presented it as a textbook for a graduate level course. It can be strongly recommended to anybody interested in classical and modern differential geometry. (jbu)

W. Keller: ***Wavelets in Geodesy and Geodynamics,*** *Walter de Gruyter, Berlin, 2004, 279 pp., 130 fig., €84, ISBN 3-11-017546-0*

This excellent textbook gives an introduction to wavelet theory both in the continuous and the discrete case. After developing the theoretical fundament, typical examples of wavelet analysis in geosciences are presented. The book consists of three main chapters. Fourier and filter theory are shortly sketched in the first chapter. The second chapter is devoted to the basics of wavelet theory. It includes the continuous as well as the discrete wavelet transform both in one- and in two-dimensional cases. A special emphasis is paid to orthogonal wavelets with finite support, because they play an important role in many applications. In the last chapter, some applications of wavelets in geosciences are reviewed. The book has developed from a graduate course held at the University of Calgary and is directed to graduate students interested in digital signal processing. The reader is assumed to have a mathematical background on the graduate level. (knaj)

B. M. Landman, A. Robertson: ***Ramsey Theory on the Integers,*** *Student Mathematical Library, vol. 24, American Mathematical Society, Providence, 2003, 317 pp., $49, ISBN 0-8218-3199-2*

The topic of this book is Ramsey theory on sets of integers. Chapter 1 introduces notation and basic results of the field, van der Waerden's theorem, Schur's theorem and Rado's theorem. The largest portion of the book, chapters 2-7, is devoted to the first result. In Chapter 2, a proof of van der Waerden's theorem is given and bounds on van der Waerden's numbers are discussed, including the breakthrough by W. Gowers. Chapters 3-7 deal with various modifications and variations on the theme of arithmetical progressions (subsets and supersets of arithmetical progressions, homothetic copies of sequences, and modular arithmetical progressions). Chapter 8 is devoted to Schur's theorem, Chapter 9 to Rado's theorem and Chapter 10 to other topics (Folkman's theorem, Brown's lemma and others). Each chapter is followed by exercises, a list of research problems, and commentary. The book concludes with a list of notation and an extensive bibliography with 275 items. (mkl)

J.-L. Lions: ***Oeuvres choisies de Jacques-Louis Lions, vol. I,*** *EDP Sciences, Paris, 2003, 722 pp., €70, ISBN 2-86883-661-5*

J.-L. Lions: ***Oeuvres choisies de Jacques-Louis Lions, vol. II,*** *EDP Sciences, Paris, 2003, 864 pp., €70, ISBN 2-86883-662-3*

J.-L. Lions: ***Oeuvres choisies de Jacques-Louis Lions, vol. III,*** *EDP Sciences, Paris, 2003, 813 pp., €70, ISBN 2-86883-663-1*

Jacques-Louis Lions, outstanding scientist and leading personality in partial differential equations and many related fields, published more than 20 monographs and more than 600 research papers. The presented three volumes represent a high level and representative sample of papers and parts of monographs carefully chosen by the scientific committee (A. Bensoussan, P. G. Sciarlet, R. Glowinski and R. Temam, with the collaboration of coordinators F. Murat and J.-P.Puel).

The first volume starts with an introduction (written by R. Temam) and a commentary by E. Magenes about his joint work with J.-L. Lions. The volume is devoted to partial differential equations and interpolation theory. It covers, roughly speaking, results published in the period between 1950 and 1960 and it contains almost 30 papers. Let us quote at least a few of the most interesting points. J.-L. Lions and E. Magenes developed a theoretical framework for solving non-homogeneous boundary value problems in a series of joint papers "Problèmes des limites non homogénes I - VII", whose first five parts are reproduced here. The Hilbert part of the theory in $H^s(\Omega)$ spaces is contained in the three volume monograph of J.-L. Lions and E. Magenes. The $W^{k,p}(\Omega)$ theory is very well described in the (fully reproduced) course by J.-L. Lions at the University of Montreal. The interpolation between Sobolev spaces plays a very important role here and thus these results are closely connected with J.-L. Lions' contributions to interpolation theory both within Hilbert spaces and Banach spaces. Significant achievements were obtained also in nonlinear partial differential equations. J.-L. Lions together with J. Leray used monotonocity methods and generalized the results of F. Browder and G. Minty to functionals of the calculus of variations that are convex in the highest derivatives only. They also presented a new and elegant proof to the results of M. Vishik. An important part of nonlinear PDEs is the classical Navier-Stokes system and its generalizations. J.-L. Lions also contributed to the modern theory of the Navier-Stokes system. He presented a new and simpler variant of Hopf's proof of the existence of weak solutions in three space dimensions - the most interesting from the point of view of physics - and in a joint paper with G. Prodi, they proved uniqueness of weak solutions in two space dimensions. Together with Q.

Stampacchia, he introduced the concept of a variational inequality, which proved to be very useful in many applications.

The second volume of the series with subtitles "Controle" and "Homogenization", is introduced by A. Bensoussan and contains results published from the end of the sixties up to the end of the nineties. J.-L. Lions' interest in optimal control theory started soon after the pioneering books of L. S. Pontryagin and R. Bellman, which appeared in 1957. Already 11 years later, Lions' book "Controle optimal des systèmes ..." was published, and it became soon a standard reference book. It was well known that the problem of optimal control for distributed systems can lead to problems with free boundary of Stefan type. J.-L. Lions used variational inequalities to make this relation straightforward. In the seventies, he generalized the notion of variational inequalities so that it was well suited to describe the problems of optimal stopping time and together with A. Bensoussan, they studied the stochastic control and variational inequalities and impulse control and quasi-variational inequalities. Later he returned to optimal control theory from a new point of view - namely the possibility of using control theory for stabilization of unstable or ill posed problems. New aspects of control theory appear also in J.-L. Lions later papers, especially his famous HUM - Hilbert uniqueness method. Together with R. Glowinsky, he introduced numerical methods suitable for solving these questions. In the second half of the seventies, J.-L. Lions was interested in the homogenisation theory for a large scale of equations with periodically oscillating coefficients. The method he used was far-reaching and applicable also to problems with an oscillating boundary or problems posed on perforated domains. Thus it made it possible in fluid mechanics to deduce Darcy's equation from Stokes' system, or to study the homogenisation of Bingham fluids. At the same time it allowed the study of mechanical properties of composite materials.

The third volume, with an introduction by P. G. Ciarlet, is devoted to numerical analysis and applications of PDEs in a wide scale of problems - the mechanics of fluids and solid bodies, Bingham fluids, viscoelastic or plastic materials, problems with friction, and plates described by linear as well as nonlinear elasticity theory. Since 1990, J.-L. Lions was attracted by very complex and complicated systems of PDEs, i.e., by climatology models. Even in this exceptional case, he, together with R. Temam and S. Wand, proved existence and uniqueness of solutions, their asymptotic behaviour and ways to their numerical solution. These two papers and more than 20 others dealing with highly interesting problems are contained in Volume III. The papers in the collection are, as well as all works by J.-L. Lions, written in a very clear and concise form and they are indispensable for researchers in PDEs and in numerical analysis. (jsta)

Y. Lu: *Hyperbolic Conservation Laws and the Compensated Compactness Method,* *Monographs and Surveys in Pure and Applied Mathematics 128, Chapman & Hall/CRC, Boca Raton, 2003, 241 pp., $84,95, ISBN 1-58488-238-7*

The book is devoted to the theory of the compensated compactness method, which is a principal tool for studying properties of systems of hyperbolic conservation laws. Quasilinear systems of hyperbolic conservation laws in one space dimension are considered. This setting (systems in one space dimension) is more or less the only case for which the existence and uniqueness results can be obtained also in a classical way, e.g. by the method of wave-front tracking. In this book a different approach is used, namely that of compensated compactness. The author introduces basic elements of the theory of compensated compactness, based on results of Tartar and Murat from the 80's. The notion of a Young measure is introduced and discussed. After these preliminaries, the author studies the Cauchy problem for a scalar equation with L^∞ and L^p data. It is to be noted that the simplified proof of the existence of the solution presented here does not need to use a concept of the Young measure. In the system case, the author works with all the usual concepts, such as the strict hyperbolicity, genuine non-linearity, linear degeneracy, Riemann invariants, entropy-entropy flux pair and theory of invariant regions to obtain uniform L-infinity estimates, symmetric and symmetrizable systems. The author then studies different important systems of hyperbolic equations, namely the system of Le Roux type, the system of the polytropic gas dynamic, Euler equations of one-dimensional compressible fluid flow, systems of elasticity and some applications of the compensated compactness to relaxation problems. The book is carefully written and will be appreciated both by PhD students and experts in the field as one of a few books gathering the knowledge until recently dispersed among research papers. (mro)

G. Mislin, A. Valette: *Proper Group Actions and the Baum-Connes Conjecture,* *Advanced Courses in Mathematics CRM Barcelona, Birkhäuser, Basel, 2003, 131 pp., €28, ISBN 3-7643-0408-1*

The book has two parts. The first contribution, by G. Mislin, contains a discussion of the equivariant *K*-homology *KG*(EG)* of the classifying space *EG* for proper actions of a group *G*. The Baum-Connes conjecture states that the *K* theory of the reduced *C** algebra of a group *G* can be computed by the equivariant K-homology *KG*(EG)*. The tools used in the exposition contain the Bredon homology for infinite groups. Relations of the Baum-Connes conjecture to many other famous conjectures in topology are described in the Appendix. The second part (written by A. Valette with Appendix by D. Kucerovsky) contains a discussion of the Baum-Connes conjecture for a countable discrete group Γ. Suitable index maps provide the link between both sides of the conjecture. The second part of the book contains a careful discussion of these maps. Both lecture notes clearly cover the area around a beautiful, interdisciplinary field and could be very useful to anybody interested in the subject. (vs)

V.Műller: *Spectral Theory of Linear Operators and Spectral Systems in Banach Algebras,* *Operator Theory Advances and Applications, vol. 139, Birkhäuser, Basel, 2003, 381 pp., €158, ISBN 3-7643-6912-4*

The monograph is written as an attempt to organize a huge amount of material on spectral theory, most of which was until now available only in research papers. The aim is to present a survey of results concerning various types of spectra in a unified, axiomatic way. The book is organized in to five chapters. At the beginning, the author presents spectral theory in Banach algebras, which forms a natural frame for spectral theory of operators. The second chapter is devoted to applications to operators. Of particular interest are regular functions: operator-valued functions whose ranges behave continuously. A suitable choice of a regular function gives rise to the important class of Kato operators and the corresponding Kato spectrum. The third chapter gives a survey of results concerning various types of essential spectra, Fredholm and Browder operators, etc. The fourth chapter contains an elementary presentation of the Taylor spectrum, which is by many experts considered to be the proper generalization of the ordinary spectrum of a single operator. The most important property of the Taylor spectrum is existence of a functional calculus for functions analytic on a neighbourhood of the Taylor spectrum. The last chapter is concentrated on the study of orbits and weak orbits of operators, which are notions closely related to the invariant subspace problem. All results are presented in an elementary way. Only a basic knowledge of functional analysis, topology and complex analysis is assumed. Moreover, basic notions and results from Banach spaces, analytic and smooth vector-valued functions and semi-continuous set-valued functions are given in the Appendix. The monograph should appeal both to students and to experts in the field. It can also serve as a reference book. (jsp)

M. C. Pedicchio, W. Tholen, Eds.: *Categorical Foundations: Special Topics in Order, Topology, Algebra, and Sheaf Theory,* *Encyclopaedia of Mathematics and Its Applications 97, Cambridge University Press, Cambridge, 2004, 440 pp., $90, ISBN 0-521-83414-7*

The book is a result of a collaborative research project of mathematicians from four European and three Canadian universities. During the years 1998 – 2001, small teams were formed to work on a variety of themes of current interest and to develop the categorical approach to them. This book presents the results of their work. The book contains 8 chapters devoted in turn to ordered set and adjunction (by R. J. Wood), locales (by J. Picado, A. Pultr and A. Tozzi), general topology (by M. M. Clementino, E. Giuli and W. Tholen), regular, protomodular and Abelian categories (by D. Bourn and M. Gran), monads (by M. C. Pedicchio and F. Rovatti), sheaf theory (by C. Centazzo and E. M. Vitale) and to effective descent morphisms (by G. Janelidze, M. Sobral and W. Tholen). Every chapter is self-contained with its own list of references. The book is very comprehensive and presents a lot of material on each of the themes. Moreover, it offers various ways of how to study "spaces" or "algebras", selecting and accentuating some of their features. The knowledge required for the reading of the book varies between the chapters, but only a modest knowledge of category theory is supposed at the beginning. The authors of each chapter develop the necessary categorical techniques themselves. The book will be very useful for graduate students and teachers, and inspiring for the researchers interested in the discussed topics as well as in category theory itself. (vtr)

G. Pisier: *Introduction to Operator Space Theory,* *London Mathematical Society Lecture Note Series 294, Cambridge University Press, Cambridge, 2003, 475 pp., £39,95, ISBN 0-521-81165-1*

The monograph is devoted to the study of operator space theory. The book has three parts. The first part contains a basic exposition of the theory and various illustrative examples. An operator space is just a (usually complex) Banach space *X,* equipped with a given embedding into the space B*(H)* of all bounded linear operators on a Hilbert space *H.* Natural morphisms in this category are completely bounded maps (a linear map is completely bounded if the naturally induced mappings between respective spaces of matrices have uniformly bounded norms). In view of this, we can have many operator space structures on a given Banach space. One of the basic tools for the theory is the Ruan theorem, which shows the correspondence between operator space structures on *X* and some kind of norms on the tensor product of *X* with the space $K(L_2)$ of compact operators on L_2. Basic operations on Banach spaces (dual space, quotient space, direct sum, complex interpolation, some tensor products, etc.) can be defined in the category of operator spaces. Some of these definitions are elementary, some make use of the Ruan theorem. It is also worth mentioning the existence (and uniqueness) of the "operator Hilbert space" - a canonical operator space structure on the Hilbert space. The second part is devoted to C*-algebras, which form a subclass of operator spaces (notice that the structure of a C*-algebra on a Banach space induces a unique operator space structure). The main themes in this part are C*-tensor products and various classes of C*-algebras and von Neumann algebras. Some properties of C*-algebras are extended to general operator spaces, and local theory of operator spaces is investigated. The third part deals with non-self-adjoint operator algebras, their tensor products and free products. The theory of operator spaces is also used to reformulate some classical similarity problems. (okal)

A. Polishchuk: *Abelian Varieties, Theta Functions and the Fourier Transform,* *Cambridge Tracts in Mathematics 153, Cambridge University Press, Cambridge, 2003, 292 pp., £47,50, ISBN 0-521-80804-9*

The book gives a modern introduction to theory of Abelian varieties and their theta functions. The text is based on lectures by the author delivered at Harvard University (1998) and Boston University (2001) and it provides an up-to-date introduction to the subject, oriented to the general mathematical community. One of the main goals is to give the first introduction to algebraic theory of Abelian varieties and theta functions, employing Mukai's approach to the Fourier transform in the context of Abelian varieties. This approach is also supported by recently discovered links to the mirror symmetry problem in algebraic geometry and quantum field theory. The exposition of material presented in the book was influenced by the category approach to problems under consideration. The book is divided into three main parts, then each of them into seven or eight chapters. Part I (Analytic Theory) discusses classical and recent aspects of transcendental theory of Abelian varieties. Part II (Algebraic Theory) is devoted to general Abelian varieties over an algebraically closed field of arbitrary characteristic. Part III (Jacobians) contains theory of Jacobian varieties of smooth irreducible projective curves over arbitrary fields. The chapters' text contains many exercises complementing the material covered. The bibliography is up-to-date and comprehensive, consisting of 138 titles. The book is primarily intended for anybody interested in modern algebraic geometry and mathematical physics, with a good background not only in complex and differential geometry, classical Fourier analysis, or representation theory, but also in modern algebraic geometry and categorical algebra. The book is written by a leading expert in the field and it will certainly be a valuable enhancement to the existing literature. (špor)

N. Saveliev: *Invariants for Homology 3-Spheres,* *Encyclopaedia of Mathematical Sciences, vol. 140, Springer, Berlin, 2002, 223 pp., €84,95, ISBN 3-540-43796-7*
The book can be considered as a fundamental monograph on invariants of homology 3-spheres. Let us mention that while the topic may seem rather specialised, these investigations have proved to be extremely useful in the manifold topology. The text covers almost all invariants from the classical Rokhlin invariant, through the Casson invariant and its various refinements and generalizations, to recent invariants of the gauge type. Quite naturally, it also contains many results on topology of 4-manifolds. Obviously, the book is designed for specialists in the field who will find there a practically complete survey of results and methods. On the other hand, it is written in such a clear style that I would like to recommend it strongly to postgraduate students starting to make themselves familiar with the field. The book will help them to learn basic notions and will gradually introduce them into contemporary research. The large number of references (311 items going up to 2001) will enable them the further orientation. (jiva)

L. Schneps, Ed.: *Galois Groups and Fundamental Groups,* *Mathematical Sciences Research Institute 41, Cambridge University Press, Cambridge, 2003, 467 pp., £50, ISBN 0-521-80831-6*
This volume is the outcome of the MSRI special semester on Galois groups and fundamental groups, held in the fall of 1999. The book contains scientific and survey articles from the most important extensions and ramifications of Galois theory - geometric Galois theory, Lie Galois theory and differential Galois theory, all in various characteristics. The main focus of the study of geometric Galois theory is the theory of curves and objects associated with them - curves with marked points, their fields of moduli and their fundamental group, covers of curves with their ramification information, finite quotients of the fundamental group that are Galois groups of the covers. The articles presented in the book include fundamental groups in positive characteristic, anabelian theory and Galois group action on fundamental groups. The subject of Lie Galois theory originates in the geometric situation, whose linearised version leads to graded Lie algebras associated with profinite fundamental groups. Special attention is paid to special loci in the moduli space with a particular group of automorphisms. Instead of considering finite groups as Galois groups of Galois extensions of arbitrary fields, differential Galois theory treats linear algebraic groups as Galois groups of so called Picard-Vessiot extensions of D-fields, which are fields equipped with derivation. (pso)

T. Sheil-Small: *Complex Polynomials,* *Cambridge Studies in Advanced Mathematics 75, Cambridge University Press, Cambridge, 2002, 428 pp., £65, ISBN 0-521-40068-6*
The book studies geometric properties of polynomials and rational functions in the complex plane. The book starts with a description of foundations of complex variable theory from the point of view of algebra as well as analysis. For example, the degree principle is studied in connection with the fundamental theorem of algebra, falling out into the mini-course of plane topology. To mention another example, the Rouché theorem is studied together with its topological analogues, including the Brouwer fixed-point theorem. After the preliminary chapter on the algebra of polynomials, the book is divided in to 11 chapters containing a study of the Jacobian problem, analytic and harmonic functions in the unit disc, trigonometric polynomials, critical points of rational functions, self-inversive polynomials and many other topics in connection with the central notion of a complex polynomial. Real polynomials are discussed in a separate chapter, including the Descartes rule of signs, distribution of critical points of real rational functions, and real entire and meromorphic functions. Blaschke products are also mentioned at the end of the book, with connection to harmonic mappings, convex curves and polygons. In general, the book offers a whole variety of concepts, oscillating among analysis, algebra and geometry. This is clearly one of the advantages of this nice publication. The book, with (or despite) its more than 400 pages, gives the reader a feeling that it is both a concise and a comprehensive monograph on the topic. It will surely be appreciated by graduate and PhD students, as well as by researchers working in the field. (mro)

J. F. Simonoff: *Analyzing Categorical Data,* *Springer Texts in Statistics, Springer, New York, 2003, 496 pp., 64 fig., €84,95, ISBN 0-387-00749-0*
The book can be divided into several parts. It starts with an introduction to regression models, including regression diagnostics and model selection. Then the author deals with discrete distributions and corresponding goodness-of-fit tests. The main topics here are binomial, multinomial, and Poisson distributions complemented by the zero-inflated Poisson model, the negative-binomial model, and the beta-binomial model. Then regression models for count data are presented. They are based mainly on generalized linear models. The part on contingency tables describes log-linear models, conditional analyses, structural zeros, outlier identification, models for tables with ordered categories, and models for square tables. The last part of the book introduces regression models for binary data and for multiple category response data. The chapters end with a section that provides references to books or articles related to the material in the chapters.

The author based this book on his notes for a class with a very diverse pool of students. The material is presented in such a way that a very heterogeneous group of students could grasp it. All methods are illustrated with analyses of real data examples. The author provides a detailed discussion of the context and background of the problem. For example, it is known that incorrect statistical analysis of data that were available at the time of the flight of Challenger on January 28, 1986, led to its explosion. It is less known that one of the recommendations of the commission was that a statistician must be part of the ground control team from that time on. All statistical modeling and figures in the text are based on S-PLUS. The author has set up a web site related to the book, where data sets and computer code are available as well as answers to selected exercises (there are more than 200 exercises in the book). On the other hand, there are no theorems and proofs in the book. Before using it as a textbook, the instructor should consult original papers and books to prepare theoretical background. At the same time, the style is not a "cookbook". The book is very interesting and it can be warmly recommended to people working with categorical data. (ja)

J. Stopple: *A Primer of Analytic Number Theory: From Pythagoras to Riemann,* *Cambridge University Press, Cambridge, 2003, 383 pp., £ 22,95, ISBN 0-521-81309-3, ISBN 0-521-01253-8*
The book constitutes an excellent undergraduate introduction to classical analytical number theory. The author develops the subject from the very beginning in an extremely good and readable style. Although a wide variety of topics are presented in the book, the author has successfully placed a rich historical background to each of the discussed themes, which makes the text very lively. The author covers topics with roots in ancient mathematics like polygonal numbers, perfect numbers, amicable pairs, basic properties of prime numbers and all central themes of the basic analytic number theory. Assuming almost no knowledge from complex analysis, he develops tools needed to show the significance of the Riemann hypothesis for the distribution of primes. Problems of additive number theory are not covered, as well as the prime number theorem. In the last three chapters of the book, the reader finds a couple of specific examples of *L*-functions attached to Diophantine equations. The material covered in these chapters includes solutions of the Pell equation, elliptic curves and analytic aspects of algebraic number theory. The text contains a rich supplement of exercises, brief sketches of more advanced ideas and extensive graphical support. The book can be recommended as a very good first introductory reading for all those who are seriously interested in analytical number theory. (špor)

W. Tutschke, H. L. Vasudeva: *An Introduction to Complex Analysis,* *Modern Analysis Series, Chapman & Hall/CRC, Boca Raton, 2004, 460 pp., $89,95, ISBN 1-584-88478-9*
The authors present two parallel approaches to complex function theory. One follows the idea that what can be used from the real analysis must be applied to lay the foundations of complex function theory, while the other one is "purely complex". The book starts with a review (86 p.) of basic methods and notions from real analysis such as metric spaces, liminf and limsup of a sequence of real numbers or the Gauss-Green formula, and basics on the field C of complex numbers and on elementary functions (in C). Then the theory is developed and this is quite often done on two levels. For example, the Cauchy theorem is first done in the version with sufficiently smooth positively oriented (firstly based on the intuition) curves bounding a bounded domain G and with function $f = u + iv$ holomorphic in G and u,v in C^1-class on the closure of G. Later on it is proved for a rectifiable boundary and f holomorphic in G and continuous on its closure. Many things, which are briefly described in other books, in remarks or exercises, are given in full details (at least 5 different proofs of the fundamental theorem of algebra are given). The book contains an exposition of analytic continuation, homotopy, conformal mappings, special functions and boundary value problems, to name the less frequently treated material. The authors will please readers interested mainly in applications as well as those who want to know how things really work and prefer deeper and more detailed treatment of the material. The book also contains more than 200 examples and 150 exercises. A certain drawback is that the fonts used in the typesetting of the book are rather small. Regardless of this fact the book is nice and I recommend it for courses in complex function theory (even on an advanced level) and also as a reference book. (jive)

C. Villani: *Topics in Optimal Transportation,* *Graduate Studies in Mathematics, vol. 58, American Mathematical Society, Providence, 2003, 370 pp., $59, ISBN 0-8218-3312-X*
The monograph is an exhaustive survey of the optimal mass transportation problem. It gives an overview of the recent knowledge of the subject and it introduces all tools convenient for its investigation. One of the principal tools used in the book is the Kantorovich duality on bounded continuous functions. Subsequent chapters introduce relevant geometric arguments needed to prove the duality theorem for the quadratic cost. Furthermore, Brenier's Polar factorisation theorem, the Monge-Ampère equation, displacement interpolation and the probabilistic metric theory, are all discussed. Relations to physical theories are also mentioned. The optimal mass transportation problem is reformulated in terms of fluid mechanics. Reformulation and explanation, by means of energy and entropy production optimisation under variational inequalities, are stated. The monograph grew from a graduate course taught by the author. The book is well organized and written in a clear and precise style. The text includes a list of illustrative problems helping to understand the theory. A certain level of mathematical skill is required from the reader. The monograph can be recommended to researchers and scientists working or interested in the field as well as an appropriate textbook for graduate and postgraduate courses on the subject. (pl)

C. Voisin: *Théorie de Hodge et géométrie algébrique complexe,* *Cours Spécialisés 10, Société Mathématique de France, Paris, 2002, 595 pp., €69, ISBN 2-85629-129-5*
Cambridge University Press published the English translation of the book in a two-volume version in 2002, 2003 resp. The review of both parts of the English translation appeared in the EMS Newsletter No. 53, p. 48. (pso)

List of reviewers for 2004

The Editor would like to thank the following for their reviews this year.

J. Anděl, R. Bashir, M. Bečvářová-Němcová, L. Beran, L. Bican, L. Boček, J. Bureš, J. Dolejší, P. Dostál, J. Drahoš, M. Ernestová, D. Hlubinka, Š. Holub, P. Holický, M. Hušková, O. John, O. Kalenda, A. Karger, T. Kepka, M. Klazar, J. Kopáček, V. Koubek, O. Kowalski, P. Kůrka, P. Lachout, J. Lukeš, J. Malý, P. Mandl, M. Markl, J. Milota, J. Mlček, E. Murtinová, K. Najzar, J. Nekovář, J. Nešetřil, I. Netuka, O. Odvárko, D. Pražák, Š. Porubský, J. Rataj, B. Riečan, M. Rokyta, T. Roubíček, P. Simon, P. Somberg, J. Souček, V. Souček, J. Spurný, J. Stará, Z. Šír, J. Štěpán, J. Trlifaj, V. Trnková, J. Tůma, J. Vanžura, J. Veselý, M. Zahradník, M. Zelený.

All of the above are on the staff of the Charles University, Faculty of Mathematics and Physics, Prague, except: M. Markl and J. Vanžura (Mathematical Institute, Czech Academy of Sciences), Š. Porubský (Technical University, Prague), B. Riečan (University of B. Bystrica, Slovakia), J. Nekovář (University Paris VI, France).