
References

1. Dean Isaacson & Richard Madsen, *Markov Chains Theory and Applications*, John Wiley & Sons, New York, 1976.
2. Warren Ewens, *Mathematical Population Genetics*, Springer-Verlag, Berlin, 1979.
3. Richard Schafer, *An Introduction to Nonassociative Algebras*, Dover Publications, Inc. New York, 1994.
4. Roberto Costa, Alexander Griohkov, Henrique Quzzo, Luiz Peresi (edited), *Nonassociative Algebra and its Applications, the Fourth International Conference*, Marcel Dekker, Inc. 2000.
5. Chris Godsil, Gordon Royle, *Algebraic Graph Theory*, Springer, 2001.
6. Jack Lohmus, Eugene Paal, Leo Sorgsepp, *Nonassociative Algebras in Physics*, Hadronic Press, Inc. 1994.
7. Santas Gonzalez (edited), *Non-Associative Algebra and Its Applications*, Kluwer Academic Publishers, Dordrecht, 1994.
8. Kevin McCrimmon, *A Taste of Jordan Algebras*, Springer, New York, 2004.
9. A. I. Kostrikin, I. R. Shafarevich, *Algebra VI*, Springer, Berlin, 1995.
10. Susumu Okubo, *Introduction to Octonion and Other Non-Associative Algebras in Physics*, Cambridge University Press, 1995.
11. John Gillespie, *Population Genetics, a Concise Guide*, the Johns Hopkins University Press, Baltimore, 1998.
12. Marshall Hall, *Combinatorial Theory*, John Wiley & Sons, New York, 1986.
13. Mark Freidlin, *Markov Processes and Differential Equations: Asymptotic Problems*, Birkhauser Verlag, Basel, 1996.
14. Francisco Ayala, John Kiger, *Modern Genetics*, the Benjamin Cummings Publishing Company, Inc. 1980.
15. Nell Campbell, *Biology*, fourth edition, the Benjamin Cummings Company, Inc. 1996.
16. Scott Freeman & Jon Herron, *Evolutionary Analysis*, Prentice Hall, 1998.
17. Noboru Nakanishi, *Graph Theory and Feynman Integrals*, Gordon and Breach Science Publishers, New York, 1971.
18. Reinhard Diestel, *Graph Theory*, second edition, Springer, New York, 2000.
19. Nathan Jacobson, *Structure and Representations of Jordan Algebras*, AMS Colloquium Publications, 1982.

20. John G. Kemeny, J. Laurie Snell, Anthony W. Knapp, *Denumerable Markov Chains*, Springer-Verlag, New York, 1976.
21. Kai Lai Chung, *Lectures from Markov Processes to Brownian Motion*, Springer-Verlag, New York, 1982.
22. Jianjun Tian & Bai-Lian Li, *Coalgebraic structure of genetic inheritance*, *Mathematical Bioscience and Engineering*, vol.1, **2**, pp243-266, 2004.
23. Jianjun Tian & Xiao-Song Lin, *Colored coalescent theory*, *Discrete and Continuous Dynamical Systems*, pp833-845, 2005.
24. Jianjun (Paul) Tian & Petr Vojtechovsky, *Mathematical concepts of evolution algebras in non-Mendelian genetics*, *Quasigroup and Related System*, Vol.24, pp111-122, 2006.
25. Jianjun Tian & Xiao-Song Lin, *Colored genealogical trees and coalescent theory*, submitted.
26. Jianjun (Paul) Tian & Xiao Song Lin, *Continuous-time Markov process on graphs*, *Stochastic Analysis and Applications*, Vol.24, **5**, pp953-972, 2006.
27. Jones, V. *Hecke algebra representations of braid groups and link polynomials*, *Ann. Math.* 126(1987), 335-388.
28. Lin, X.-S. Tian, F. & Wang, Z. *Bureau representation and random walks on string links*, *Pacific J. Math.* 182, **2**, 289-301, 1998.
29. Graver, J. E. & Watkins, M. E. *Combinatorics with Emphasis on the Theory of Graphs*, Springer-Verlag, New York, 1977.
30. Mendel, G., *Experiments in plant-hybridization*, *Classic Papers in Genetics*, pages 1-20, J. A. Peter editor, Prentice-Hall Inc. 1959.
31. Serebrowsky, A., *On the properties of the Mendelian equations*, *Doklady A.N.SSSR.* **2**, 33-36, 1934 (in Russian).
32. Glivenkov, V., *Algebra Mendelienne comptes rendus* (Doklady) de l'Acad. des Sci. de l'URSS **4**, (13), 385-386, 1936 (in Russian).
33. Kostitzin, V.A., *Sur les coefficients mendeliens d'heredite*, *Comptes rendus de l'Acad. des Sci.* **206**, 883-885, 1938 (in French).
34. Etherington, I.M.H., *Non-associative algebra and the symbolism of genetics*, *Proc. Roy. Soc. Edinburgh B* **61**, 24-42, 1941.
35. Gonshor, H., *Contributions to genetic algebras*, *Proc. Edinburgh Math. Soc* (2), 273-279, 1973.
36. Schafer, R.D., *An introduction to non-associative algebras*, Acad. Press, New York, 1966.
37. Holgate, P., *Sequences of powers in genetic algebras*, *J. London Math.*, **42**, 489-496, 1967.
38. Holgate, P., *Selfing in gentic algebras*, *J. Math. Biology*, **6**, 197-206, 1978.
39. Hench, I., *Sequences in genetic algebras for overlapping generations*, *Proc. Edinburgh Math. Soc.* (2) **18**, 19-29, 1972.
40. Reiser, O., *Genetic algebras studied recursively and by means of differential operators*, *Math. Scand.* **10**, 25-44, 1962.
41. Abraham, V.M., *Linearising quadratic transformations in genetic algebras*, Thesis, Univ. of London, 1976.
42. Kempthorne, O., *An Introduction to Genetic Statistics*, John Wiley & Son, Inc., New York, 1950.
43. Sloane, N.J.A., and Wyner, A.D., (editors) *Claude Elwood Shannon Collected Papers*, IEEE Press, Piscataway, NJ. 1993.
44. Cotterma, C.W., *A calculus for statistico-genetics*, Dissertation, The Ohio State University, Columbus, OH. 1940.

45. Ballonoff, P., *Genetics and Social Structure*, Dowden, Hutchinson & Ross, Stroudsburg, PA. 1974.
46. Worz-Busekros, A., *Algebras in Genetics*, Lecture Notes in Biomath. 36, Springer-Verlag, Berlin, 1980.
47. Lyubich, Y.I., *Mathematical Structures in Population Genetics*, Springer-Verlag, New York, 1992.
48. Reed, M.L., *Algebraic structure of genetic inheritance*, Bull. of AMS, 34, (2), 107-130, 1997.
49. Baur, E., *Zeit. Vererbungsl.* **1**, 330-351, 1909.
50. Correns, C., *Zeit. Vererbungsl.* **1**, 291-329, 1909.
51. Birky, C.W.Jr., *The inheritance of genes in mitochondria and chloroplasts: laws, mechanisms, and models*, Annu. Rev. Genet. **35**, 125-148, 2001.
52. Birky, C.W.Jr., *Inheritance of mitochondrial mutations*, Mitochondrial DNA Mutations and Aging, Disease and Cancer, K.K. Singh, edit, Spring, 1998
53. Gillham, N.W., *Organelle Genes and Genomes*, Oxford University Press, 1994
54. Emmerson, C.F., Brown, G.K. and Poulton, J., *Synthesis of mitochondrial DNA in permeabilised human cultured cells*, Nucleic Acids Res. 29, **2**, 2001.
55. Ling F. and Shibata, T., *Mhr1p-dependent concatemeric mitochondrial DNA formation for generating yeast mitochondrial homoplasmic cells*, Mol. Biol. Cell, vol.15, 310-322, Jan. 2004.
56. Tang, Y., Manfredi, G., Hirano, M. and Schon, E.A., *Maintenance of human rearranged mitochondrial DNAs in long-term transmitochondrial cell lines*, Mol. Biol. Cell, vol.11, 2349-2358, Jul. 2000
57. Samen, F.M.A., Secor, G.A., and Gudmestad, N.C., *Variability in virulence among asexual progenies of Phytophthora infestans*, Phytopathology, **93**, 293-304, 2003.
58. Fry, W.E. and Goodwin, S.B., —textitRe-emergence of potato and tomato late blight in the United States, Plant Disease, 1349-1357, dec. 1997.
59. Goodwin, S.B., Cohen, B.A., and Fry, W.E., *Panglobal distribution of a single clonal lineage of the Irish potato famine fungus*, Proc. Natl. Acad. Sci. USA, **91**, 11591-11595, 1994.
60. Goodwin, S.B., *The population genetics of Phytophthora*, Phytopathology, **87**, 462-473, 1997.
61. Flor, H.H., *Current status of the gene for gene concept*, Annu. Rev. Phytopathol. **9**, 275-296, 1971.

Index

- $(N - 1) - th$ fundamental operators, 81
- 1 - st fundamental operators, 80
- 2 - nd fundamental operators, 81
- k th transient spaces, 48
- 2nd induced evolution algebras, 48

- absorbing states, 59
- algebraic periodicity, 69
- algebraic persistency, 42, 67, 97
- algebraic transiency, 42, 65, 66, 97
- alleles, 93
- anti-symmetric linear map, 13
- asexual inheritance, 11
- asexual reproduction, 9, 93
- automorphism groups, 32
- autosomal loci, 10

- Banach algebras, 39
- Banach spaces, 38
- Banach subalgebras, 39
- baric algebras, 3, 92
- binary fission, 9
- binomial random variable, 11
- biological stability, 97
- biparental, 94
- bounded linear operators, 37
- bracketed words, 18
- braid groups, 15
- Brouwer's fixed point theorem, 70
- Bureau representations, 15

- capacity functions, 13
- centroid, 35
- Chapman-Kolmogorov equations, 55, 57

- characteristic states, 56, 63
- chloroplasts, 94
- chromosome, 93
- classes of skeleton-shapes, 50, 52
- classes of skeletons, 50, 52
- classifications of evolution algebras, 51
- closed subsets of states, 59
- compete algebras, 112
- connected evolution algebras, 24, 68
- continuous time Markov chains, 115
- cycle algebras, 112

- defining relations, 17
- derivative genes, 2, 92
- derived Lie algebras, 35
- destination operators, 60
- diploid population, 11
- discrete time Markov chains, 16, 53
- dynamical behavior, 45

- embedded graphs, 15
- endosymbiotic origin, 94
- equilibrium states, 70
- eukaryotic cells, 95
- evolution algebra's hierarchy, 46, 48
- evolution homomorphisms, 23
- evolution ideals, 23, 24
- evolution isomorphisms, 23
- evolution operators, 29
- evolution subalgebras, 23
- external edges, 13

- factor algebras, 18
- Feynman graph, 13

- Feynman integral, 14
- first algebraic persistency, 47
- first induced periodicity, 47
- first visiting operators, 60
- flexible algebras, 20
- free algebras, 18
- fundamental operators, 78

- gamete algebras, 11
- gametes, 10
- gene recombination, 9
- gene transduction, 9
- generators, 17
- genetic algebras, 2, 10, 91
- genetic transmission, 95
- graphicable algebras, 110
- group theory, 114

- heteroplasmic, 96, 97
- heterozygous, 93
- hierarchical structures, 43
- hierarchy of Markov chains, 77
- homoplasmic, 96–98
- homoplasmic cells, 94

- idempotent generators, 59
- Ihara-Selberg zeta functions, 115
- induced evolution operators, 47
- induced evolution subalgebras, 47
- induced multiplications, 46
- intercommunicate, 27, 42
- internal edges, 13
- irreducible, 59
- irreducible evolution algebras, 24

- Kirchhoff's law, 13
- Kronecker product, 20

- Landau equations, 14
- Laplace-Beltrami operators, 116

- Markov evolution algebras, 18, 53, 54
- mass functions, 55, 56
- mean first occurrence times, 85
- Mendelian algebras, 2, 91
- Mendelian genetics, 94
- mitochondria, 94
- multiplication algebras, 33
- multiplication of 3-dimensional matrices, 116

- natural basis, 20
- network flow theory, 12
- network flows, 13
- networks, 113
- non-Mendelian genetics, 94
- nonnegative elements, 58
- nonnegative evolution algebras, 18
- nonnegative simple evolution algebras, 41, 44
- nonpositive elements, 58
- norms of evolution algebras, 37

- occurrence relations, 26
- organelle biology, 94

- path algebras, 112
- periodicity of generators, 40
- phylogenetic trees, 116
- Phytophthora infestans*, 100
- plenary powers of matrices, 40
- positive braids, 15
- positive evolution operators, 70
- power-associative, 20
- preference coefficients, 12
- presentable isomorphic, 110
- probabilistic periodicity, 69
- probabilistic persistency, 63, 67
- probabilistic transiency, 63, 65, 66
- probability vectors, 56
- prokaryotes, 9

- quotient algebras, 25

- random walks, 114
- real evolution algebras, 18
- reduced bracketed words, 19
- reducibility, 49
- regular evolution algebras, 83
- reproduction, 54
- reproductive behavior, 45
- rigidness, 31

- semi-direct-sum decomposition, 45
- semisimple, 25
- semisimple evolution algebras, 68
- simple evolution algebras, 24, 42
- simple evolution algebras with period d , 73
- simple evolution subalgebras, 48
- skeletons of evolution algebras, 49, 50
- sojourn times, 83

spectrum radius, 80
spectrum theory, 69
stability of evolution operators, 78
subalgebras, 59

train algebras, 3, 92
transition probabilities, 16, 54
transition probability matrices, 54
transitory, 97
triplasmic, 99

trivial evolution algebras, 18

uniparental, 94
unity elements, 22

vegetative segregation, 95, 96

Wright-Fisher models, 11, 96

zoospores, 101
zygotes, 10

Lecture Notes in Mathematics

For information about earlier volumes
please contact your bookseller or Springer
LNM Online archive: springerlink.com

- Vol. 1732: K. Keller, Invariant Factors, Julia Equivalences and the (Abstract) Mandelbrot Set (2000)
- Vol. 1733: K. Ritter, Average-Case Analysis of Numerical Problems (2000)
- Vol. 1734: M. Espedal, A. Fasano, A. Mikelić, Filtration in Porous Media and Industrial Applications. Cetraro 1998. Editor: A. Fasano. 2000.
- Vol. 1735: D. Yafaev, Scattering Theory: Some Old and New Problems (2000)
- Vol. 1736: B. O. Turesson, Nonlinear Potential Theory and Weighted Sobolev Spaces (2000)
- Vol. 1737: S. Wakabayashi, Classical Microlocal Analysis in the Space of Hyperfunctions (2000)
- Vol. 1738: M. Émery, A. Nemirovski, D. Voiculescu, Lectures on Probability Theory and Statistics (2000)
- Vol. 1739: R. Burkard, P. Deuffhard, A. Jameson, J.-L. Lions, G. Strang, Computational Mathematics Driven by Industrial Problems. Martina Franca, 1999. Editors: V. Capasso, H. Engl, J. Periaux (2000)
- Vol. 1740: B. Kawohl, O. Pironneau, L. Tartar, J.-P. Zolesio, Optimal Shape Design. Tróia, Portugal 1999. Editors: A. Cellina, A. Ornelas (2000)
- Vol. 1741: E. Lombardi, Oscillatory Integrals and Phenomena Beyond all Algebraic Orders (2000)
- Vol. 1742: A. Unterberger, Quantization and Non-holomorphic Modular Forms (2000)
- Vol. 1743: L. Habermann, Riemannian Metrics of Constant Mass and Moduli Spaces of Conformal Structures (2000)
- Vol. 1744: M. Kunze, Non-Smooth Dynamical Systems (2000)
- Vol. 1745: V. D. Milman, G. Schechtman (Eds.), Geometric Aspects of Functional Analysis. Israel Seminar 1999-2000 (2000)
- Vol. 1746: A. Degtyarev, I. Itenberg, V. Kharlamov, Real Enriques Surfaces (2000)
- Vol. 1747: L. W. Christensen, Gorenstein Dimensions (2000)
- Vol. 1748: M. Ruzicka, Electrorheological Fluids: Modeling and Mathematical Theory (2001)
- Vol. 1749: M. Fuchs, G. Seregin, Variational Methods for Problems from Plasticity Theory and for Generalized Newtonian Fluids (2001)
- Vol. 1750: B. Conrad, Grothendieck Duality and Base Change (2001)
- Vol. 1751: N. J. Cutland, Loeb Measures in Practice: Recent Advances (2001)
- Vol. 1752: Y. V. Nesterenko, P. Philippon, Introduction to Algebraic Independence Theory (2001)
- Vol. 1753: A. I. Bobenko, U. Eitner, Painlevé Equations in the Differential Geometry of Surfaces (2001)
- Vol. 1754: W. Bertram, The Geometry of Jordan and Lie Structures (2001)
- Vol. 1755: J. Azéma, M. Émery, M. Ledoux, M. Yor (Eds.), Séminaire de Probabilités XXXV (2001)
- Vol. 1756: P. E. Zhidkov, Korteweg de Vries and Nonlinear Schrödinger Equations: Qualitative Theory (2001)
- Vol. 1757: R. R. Phelps, Lectures on Choquet's Theorem (2001)
- Vol. 1758: N. Monod, Continuous Bounded Cohomology of Locally Compact Groups (2001)
- Vol. 1759: Y. Abe, K. Kopfermann, Toroidal Groups (2001)
- Vol. 1760: D. Filipović, Consistency Problems for Heath-Jarrow-Morton Interest Rate Models (2001)
- Vol. 1761: C. Adelmann, The Decomposition of Primes in Torsion Point Fields (2001)
- Vol. 1762: S. Cerrai, Second Order PDE's in Finite and Infinite Dimension (2001)
- Vol. 1763: J.-L. Loday, A. Frabetti, F. Chapoton, F. Gochot, Dialgebras and Related Operads (2001)
- Vol. 1764: A. Cannas da Silva, Lectures on Symplectic Geometry (2001)
- Vol. 1765: T. Kerler, V. V. Lyubashenko, Non-Semisimple Topological Quantum Field Theories for 3-Manifolds with Corners (2001)
- Vol. 1766: H. Hennion, L. Hervé, Limit Theorems for Markov Chains and Stochastic Properties of Dynamical Systems by Quasi-Compactness (2001)
- Vol. 1767: J. Xiao, Holomorphic Q Classes (2001)
- Vol. 1768: M. J. Pflaum, Analytic and Geometric Study of Stratified Spaces (2001)
- Vol. 1769: M. Alberich-Carramiñana, Geometry of the Plane Cremona Maps (2002)
- Vol. 1770: H. Gluesing-Luerssen, Linear Delay-Differential Systems with Commensurate Delays: An Algebraic Approach (2002)
- Vol. 1771: M. Émery, M. Yor (Eds.), Séminaire de Probabilités 1967-1980. A Selection in Martingale Theory (2002)
- Vol. 1772: F. Burstall, D. Ferus, K. Leschke, F. Pedit, U. Pinkall, Conformal Geometry of Surfaces in S^4 (2002)
- Vol. 1773: Z. Arad, M. Muzychuk, Standard Integral Table Algebras Generated by a Non-real Element of Small Degree (2002)
- Vol. 1774: V. Runde, Lectures on Amenability (2002)
- Vol. 1775: W. H. Meeks, A. Ros, H. Rosenberg, The Global Theory of Minimal Surfaces in Flat Spaces. Martina Franca 1999. Editor: G. P. Pirola (2002)
- Vol. 1776: K. Behrend, C. Gomez, V. Tarasov, G. Tian, Quantum Cohomology. Cetraro 1997. Editors: P. de Bartolomeis, B. Dubrovin, C. Reina (2002)
- Vol. 1777: E. García-Río, D. N. Kupeli, R. Vázquez-Lorenzo, Osserman Manifolds in Semi-Riemannian Geometry (2002)
- Vol. 1778: H. Kiechle, Theory of K-Loops (2002)
- Vol. 1779: I. Chueshov, Monotone Random Systems (2002)
- Vol. 1780: J. H. Bruinier, Borcherds Products on $O(2,1)$ and Chern Classes of Heegner Divisors (2002)

- Vol. 1781: E. Bolthausen, E. Perkins, A. van der Vaart, Lectures on Probability Theory and Statistics. Ecole d'Été de Probabilités de Saint-Flour XXIX-1999. Editor: P. Bernard (2002)
- Vol. 1782: C.-H. Chu, A. T.-M. Lau, Harmonic Functions on Groups and Fourier Algebras (2002)
- Vol. 1783: L. Grüne, Asymptotic Behavior of Dynamical and Control Systems under Perturbation and Discretization (2002)
- Vol. 1784: L. H. Eliasson, S. B. Kuksin, S. Marmi, J.-C. Yoccoz, Dynamical Systems and Small Divisors. Cetraro, Italy 1998. Editors: S. Marmi, J.-C. Yoccoz (2002)
- Vol. 1785: J. Arias de Reyna, Pointwise Convergence of Fourier Series (2002)
- Vol. 1786: S. D. Cutkosky, Monomialization of Morphisms from 3-Folds to Surfaces (2002)
- Vol. 1787: S. Caenepeel, G. Militaru, S. Zhu, Frobenius and Separable Functors for Generalized Module Categories and Nonlinear Equations (2002)
- Vol. 1788: A. Vasil'ev, Moduli of Families of Curves for Conformal and Quasiconformal Mappings (2002)
- Vol. 1789: Y. Sommerhäuser, Yetter-Drinfel'd Hopf algebras over groups of prime order (2002)
- Vol. 1790: X. Zhan, Matrix Inequalities (2002)
- Vol. 1791: M. Knebusch, D. Zhang, Manis Valuations and Prüfer Extensions I: A new Chapter in Commutative Algebra (2002)
- Vol. 1792: D. D. Ang, R. Gorenflo, V. K. Le, D. D. Trong, Moment Theory and Some Inverse Problems in Potential Theory and Heat Conduction (2002)
- Vol. 1793: J. Cortés Monforte, Geometric, Control and Numerical Aspects of Nonholonomic Systems (2002)
- Vol. 1794: N. Pytheas Fogg, Substitution in Dynamics, Arithmetics and Combinatorics. Editors: V. Berthé, S. Ferenczi, C. Mauduit, A. Siegel (2002)
- Vol. 1795: H. Li, Filtered-Graded Transfer in Using Non-commutative Gröbner Bases (2002)
- Vol. 1796: J.M. Melenk, hp-Finite Element Methods for Singular Perturbations (2002)
- Vol. 1797: B. Schmidt, Characters and Cyclotomic Fields in Finite Geometry (2002)
- Vol. 1798: W.M. Oliva, Geometric Mechanics (2002)
- Vol. 1799: H. Pajot, Analytic Capacity, Rectifiability, Menger Curvature and the Cauchy Integral (2002)
- Vol. 1800: O. Gabber, L. Ramero, Almost Ring Theory (2003)
- Vol. 1801: J. Azéma, M. Émery, M. Ledoux, M. Yor (Eds.), Séminaire de Probabilités XXXVI (2003)
- Vol. 1802: V. Capasso, E. Merzbach, B. G. Ivanoff, M. Dozzi, R. Dalang, T. Mountford, Topics in Spatial Stochastic Processes. Martina Franca, Italy 2001. Editor: E. Merzbach (2003)
- Vol. 1803: G. Dolzmann, Variational Methods for Crystalline Microstructure – Analysis and Computation (2003)
- Vol. 1804: I. Cherednik, Ya. Markov, R. Howe, G. Lusztig, Iwahori-Hecke Algebras and their Representation Theory. Martina Franca, Italy 1999. Editors: V. Baldoni, D. Barbasch (2003)
- Vol. 1805: F. Cao, Geometric Curve Evolution and Image Processing (2003)
- Vol. 1806: H. Broer, I. Hoveijn, G. Lunther, G. Vegter, Bifurcations in Hamiltonian Systems. Computing Singularities by Gröbner Bases (2003)
- Vol. 1807: V.D. Milman, G. Schechtman (Eds.), Geometric Aspects of Functional Analysis. Israel Seminar 2000-2002 (2003)
- Vol. 1808: W. Schindler, Measures with Symmetry Properties (2003)
- Vol. 1809: O. Steinbach, Stability Estimates for Hybrid Coupled Domain Decomposition Methods (2003)
- Vol. 1810: J. Wengenroth, Derived Functors in Functional Analysis (2003)
- Vol. 1811: J. Stevens, Deformations of Singularities (2003)
- Vol. 1812: L. Ambrosio, K. Deckelnick, G. Dziuk, M. Mimura, V. A. Solonnikov, H. M. Soner, Mathematical Aspects of Evolving Interfaces. Madeira, Funchal, Portugal 2000. Editors: P. Colli, J. F. Rodrigues (2003)
- Vol. 1813: L. Ambrosio, L. A. Caffarelli, Y. Brenier, G. Buttazzo, C. Villani, Optimal Transportation and its Applications. Martina Franca, Italy 2001. Editors: L. A. Caffarelli, S. Salsa (2003)
- Vol. 1814: P. Bank, F. Baudoin, H. Föllmer, L.C.G. Rogers, M. Soner, N. Touzi, Paris-Princeton Lectures on Mathematical Finance 2002 (2003)
- Vol. 1815: A. M. Vershik (Ed.), Asymptotic Combinatorics with Applications to Mathematical Physics. St. Petersburg, Russia 2001 (2003)
- Vol. 1816: S. Albeverio, W. Schachermayer, M. Tala-grand, Lectures on Probability Theory and Statistics. Ecole d'Été de Probabilités de Saint-Flour XXX-2000. Editor: P. Bernard (2003)
- Vol. 1817: E. Koelink, W. Van Assche (Eds.), Orthogonal Polynomials and Special Functions. Leuven 2002 (2003)
- Vol. 1818: M. Bildhauer, Convex Variational Problems with Linear, nearly Linear and/or Anisotropic Growth Conditions (2003)
- Vol. 1819: D. Masser, Yu. V. Nesterenko, H. P. Schlickeweï, W. M. Schmidt, M. Waldschmidt, Diophantine Approximation. Cetraro, Italy 2000. Editors: F. Amoroso, U. Zannier (2003)
- Vol. 1820: F. Hiai, H. Kosaki, Means of Hilbert Space Operators (2003)
- Vol. 1821: S. Teufel, Adiabatic Perturbation Theory in Quantum Dynamics (2003)
- Vol. 1822: S.-N. Chow, R. Conti, R. Johnson, J. Mallet-Paret, R. Nussbaum, Dynamical Systems. Cetraro, Italy 2000. Editors: J. W. Macki, P. Zecca (2003)
- Vol. 1823: A. M. Anile, W. Allegretto, C. Ringhofer, Mathematical Problems in Semiconductor Physics. Cetraro, Italy 1998. Editor: A. M. Anile (2003)
- Vol. 1824: J. A. Navarro González, J. B. Sancho de Salas, \mathcal{C}^∞ – Differentiable Spaces (2003)
- Vol. 1825: J. H. Bramble, A. Cohen, W. Dahmen, Multiscale Problems and Methods in Numerical Simulations, Martina Franca, Italy 2001. Editor: C. Canuto (2003)
- Vol. 1826: K. Dohmen, Improved Bonferroni Inequalities via Abstract Tubes. Inequalities and Identities of Inclusion-Exclusion Type. VIII, 113 p, 2003.
- Vol. 1827: K. M. Pilgrim, Combinations of Complex Dynamical Systems. IX, 118 p, 2003.
- Vol. 1828: D. J. Green, Gröbner Bases and the Computation of Group Cohomology. XII, 138 p, 2003.
- Vol. 1829: E. Altman, B. Gaujal, A. Hordijk, Discrete-Event Control of Stochastic Networks: Multimodularity and Regularity. XIV, 313 p, 2003.
- Vol. 1830: M. I. Gil', Operator Functions and Localization of Spectra. XIV, 256 p, 2003.
- Vol. 1831: A. Connes, J. Cuntz, E. Guentner, N. Higson, J. E. Kaminker, Noncommutative Geometry, Martina Franca, Italy 2002. Editors: S. Doplicher, L. Longo (2004)
- Vol. 1832: J. Azéma, M. Émery, M. Ledoux, M. Yor (Eds.), Séminaire de Probabilités XXXVII (2003)

- Vol. 1833: D.-Q. Jiang, M. Qian, M.-P. Qian, *Mathematical Theory of Nonequilibrium Steady States. On the Frontier of Probability and Dynamical Systems. IX*, 280 p, 2004.
- Vol. 1834: Yo. Yomdin, G. Comte, *Tame Geometry with Application in Smooth Analysis. VIII*, 186 p, 2004.
- Vol. 1835: O.T. Izhboldin, B. Kahn, N.A. Karpenko, A. Vishik, *Geometric Methods in the Algebraic Theory of Quadratic Forms. Summer School, Lens, 2000*. Editor: J.-P. Tignol (2004)
- Vol. 1836: C. Năstăsescu, F. Van Oystaeyen, *Methods of Graded Rings. XIII*, 304 p, 2004.
- Vol. 1837: S. Tavaré, O. Zeitouni, *Lectures on Probability Theory and Statistics. Ecole d'Eté de Probabilités de Saint-Flour XXXI-2001*. Editor: J. Picard (2004)
- Vol. 1838: A.J. Ganesh, N.W. O'Connell, D.J. Wischik, *Big Queues. XII*, 254 p, 2004.
- Vol. 1839: R. Gohm, *Noncommutative Stationary Processes. VIII*, 170 p, 2004.
- Vol. 1840: B. Tsirelson, W. Werner, *Lectures on Probability Theory and Statistics. Ecole d'Eté de Probabilités de Saint-Flour XXXII-2002*. Editor: J. Picard (2004)
- Vol. 1841: W. Reichel, *Uniqueness Theorems for Variational Problems by the Method of Transformation Groups (2004)*
- Vol. 1842: T. Johnsen, A. L. Knutsen, *K_3 Projective Models in Scrolls (2004)*
- Vol. 1843: B. Jefferies, *Spectral Properties of Noncommuting Operators (2004)*
- Vol. 1844: K.F. Siburg, *The Principle of Least Action in Geometry and Dynamics (2004)*
- Vol. 1845: Min Ho Lee, *Mixed Automorphic Forms, Torus Bundles, and Jacobi Forms (2004)*
- Vol. 1846: H. Ammari, H. Kang, *Reconstruction of Small Inhomogeneities from Boundary Measurements (2004)*
- Vol. 1847: T.R. Bielecki, T. Björk, M. Jeanblanc, M. Rutkowski, J.A. Scheinkman, W. Xiong, *Paris-Princeton Lectures on Mathematical Finance 2003 (2004)*
- Vol. 1848: M. Abate, J. E. Fornæss, X. Huang, J. P. Rosay, A. Tumanov, *Real Methods in Complex and CR Geometry, Martina Franca, Italy 2002*. Editors: D. Zaitsev, G. Zampieri (2004)
- Vol. 1849: Martin L. Brown, *Heegner Modules and Elliptic Curves (2004)*
- Vol. 1850: V. D. Milman, G. Schechtman (Eds.), *Geometric Aspects of Functional Analysis. Israel Seminar 2002-2003 (2004)*
- Vol. 1851: O. Catoni, *Statistical Learning Theory and Stochastic Optimization (2004)*
- Vol. 1852: A.S. Kechris, B.D. Miller, *Topics in Orbit Equivalence (2004)*
- Vol. 1853: Ch. Favre, M. Jonsson, *The Valutive Tree (2004)*
- Vol. 1854: O. Saeki, *Topology of Singular Fibers of Differential Maps (2004)*
- Vol. 1855: G. Da Prato, P.C. Kunstmann, I. Lasiecka, A. Lunardi, R. Schnaubelt, L. Weis, *Functional Analytic Methods for Evolution Equations*. Editors: M. Iannelli, R. Nagel, S. Piazzera (2004)
- Vol. 1856: K. Back, T.R. Bielecki, C. Hipp, S. Peng, W. Schachermayer, *Stochastic Methods in Finance, Bressanone/Brixen, Italy, 2003*. Editors: M. Frittelli, W. Runggaldier (2004)
- Vol. 1857: M. Émery, M. Ledoux, M. Yor (Eds.), *Séminaire de Probabilités XXXVIII (2005)*
- Vol. 1858: A.S. Cherny, H.-J. Engelbert, *Singular Stochastic Differential Equations (2005)*
- Vol. 1859: E. Letellier, *Fourier Transforms of Invariant Functions on Finite Reductive Lie Algebras (2005)*
- Vol. 1860: A. Borisyuk, G.B. Ermentrout, A. Friedman, D. Terman, *Tutorials in Mathematical Biosciences I. Mathematical Neurosciences (2005)*
- Vol. 1861: G. Benettin, J. Henrard, S. Kuksin, *Hamiltonian Dynamics – Theory and Applications, Cetraro, Italy, 1999*. Editor: A. Giorgilli (2005)
- Vol. 1862: B. Helffer, F. Nier, *Hypoelliptic Estimates and Spectral Theory for Fokker-Planck Operators and Witten Laplacians (2005)*
- Vol. 1863: H. Führ, *Abstract Harmonic Analysis of Continuous Wavelet Transforms (2005)*
- Vol. 1864: K. Efstathiou, *Metamorphoses of Hamiltonian Systems with Symmetries (2005)*
- Vol. 1865: D. Applebaum, B.V. R. Bhat, J. Kustermans, J. M. Lindsay, *Quantum Independent Increment Processes I. From Classical Probability to Quantum Stochastic Calculus*. Editors: M. Schürmann, U. Franz (2005)
- Vol. 1866: O.E. Barndorff-Nielsen, U. Franz, R. Gohm, B. Kümmerer, S. Thorbjørnsen, *Quantum Independent Increment Processes II. Structure of Quantum Lévy Processes, Classical Probability, and Physics*. Editors: M. Schürmann, U. Franz, (2005)
- Vol. 1867: J. Sneyd (Ed.), *Tutorials in Mathematical Biosciences II. Mathematical Modeling of Calcium Dynamics and Signal Transduction. (2005)*
- Vol. 1868: J. Jorgenson, S. Lang, *Pos_n(R) and Eisenstein Series. (2005)*
- Vol. 1869: A. Dembo, T. Funaki, *Lectures on Probability Theory and Statistics. Ecole d'Eté de Probabilités de Saint-Flour XXXIII-2003*. Editor: J. Picard (2005)
- Vol. 1870: V.I. Gurariy, W. Lusky, *Geometry of Müntz Spaces and Related Questions. (2005)*
- Vol. 1871: P. Constantin, G. Gallavotti, A.V. Kazhikhov, Y. Meyer, S. Ukai, *Mathematical Foundation of Turbulent Viscous Flows, Martina Franca, Italy, 2003*. Editors: M. Cannone, T. Miyakawa (2006)
- Vol. 1872: A. Friedman (Ed.), *Tutorials in Mathematical Biosciences III. Cell Cycle, Proliferation, and Cancer (2006)*
- Vol. 1873: R. Mansuy, M. Yor, *Random Times and Enlargements of Filtrations in a Brownian Setting (2006)*
- Vol. 1874: M. Yor, M. Émery (Eds.), *In Memoriam Paul-André Meyer - Séminaire de Probabilités XXXIX (2006)*
- Vol. 1875: J. Pitman, *Combinatorial Stochastic Processes. Ecole d'Eté de Probabilités de Saint-Flour XXXII-2002*. Editor: J. Picard (2006)
- Vol. 1876: H. Herrlich, *Axiom of Choice (2006)*
- Vol. 1877: J. Steuding, *Value Distributions of L-Functions (2007)*
- Vol. 1878: R. Cerf, *The Wulff Crystal in Ising and Percolation Models. Ecole d'Eté de Probabilités de Saint-Flour XXXIV-2004*. Editor: Jean Picard (2006)
- Vol. 1879: G. Slade, *The Lace Expansion and its Applications, Ecole d'Eté de Probabilités de Saint-Flour XXXIV-2004*. Editor: Jean Picard (2006)
- Vol. 1880: S. Attal, A. Joye, C.-A. Pillet, *Open Quantum Systems I, The Hamiltonian Approach (2006)*
- Vol. 1881: S. Attal, A. Joye, C.-A. Pillet, *Open Quantum Systems II, The Markovian Approach (2006)*
- Vol. 1882: S. Attal, A. Joye, C.-A. Pillet, *Open Quantum Systems III, Recent Developments (2006)*
- Vol. 1883: W. Van Assche, F. Marcellàn (Eds.), *Orthogonal Polynomials and Special Functions, Computation and Application (2006)*

Vol. 1884: N. Hayashi, E.I. Kaikina, P.I. Naumkin, I.A. Shishmarev, Asymptotics for Dissipative Nonlinear Equations (2006)

Vol. 1885: A. Telcs, The Art of Random Walks (2006)

Vol. 1886: S. Takamura, Splitting Deformations of Degenerations of Complex Curves (2006)

Vol. 1887: K. Habermann, L. Habermann, Introduction to Symplectic Dirac Operators (2006)

Vol. 1888: J. van der Hoeven, Transseries and Real Differential Algebra (2006)

Vol. 1889: G. Osipenko, Dynamical Systems, Graphs, and Algorithms (2006)

Vol. 1890: M. Bunge, J. Funk, Singular Coverings of Toposes (2006)

Vol. 1891: J.B. Friedlander, D.R. Heath-Brown, H. Iwaniec, J. Kaczorowski, Analytic Number Theory, Cetraro, Italy, 2002. Editors: A. Perelli, C. Viola (2006)

Vol. 1892: A. Baddeley, I. Bárány, R. Schneider, W. Weil, Stochastic Geometry, Martina Franca, Italy, 2004. Editor: W. Weil (2007)

Vol. 1893: H. Hanßmann, Local and Semi-Local Bifurcations in Hamiltonian Dynamical Systems, Results and Examples (2007)

Vol. 1894: C.W. Groetsch, Stable Approximate Evaluation of Unbounded Operators (2007)

Vol. 1895: L. Molnár, Selected Preserver Problems on Algebraic Structures of Linear Operators and on Function Spaces (2007)

Vol. 1896: P. Massart, Concentration Inequalities and Model Selection, Ecole d'Été de Probabilités de Saint-Flour XXXIII-2003. Editor: J. Picard (2007)

Vol. 1897: R. Doney, Fluctuation Theory for Lévy Processes, Ecole d'Été de Probabilités de Saint-Flour XXXV-2005. Editor: J. Picard (2007)

Vol. 1898: H.R. Beyer, Beyond Partial Differential Equations, On linear and Quasi-Linear Abstract Hyperbolic Evolution Equations (2007)

Vol. 1899: Séminaire de Probabilités XL. Editors: C. Donati-Martin, M. Émery, A. Rouault, C. Stricker (2007)

Vol. 1900: E. Bolthausen, A. Bovier (Eds.), Spin Glasses (2007)

Vol. 1901: O. Wittenberg, Intersections de deux quadriques et pinceaux de courbes de genre 1, Intersections of Two Quadrics and Pencils of Curves of Genus 1 (2007)

Vol. 1902: A. Isaev, Lectures on the Automorphism Groups of Kobayashi-Hyperbolic Manifolds (2007)

Vol. 1903: G. Kresin, V. Maz'ya, Sharp Real-Part Theorems (2007)

Vol. 1904: P. Giesl, Construction of Global Lyapunov Functions Using Radial Basis Functions (2007)

Vol. 1905: C. Prévôt, M. Röckner, A Concise Course on Stochastic Partial Differential Equations (2007)

Vol. 1906: T. Schuster, The Method of Approximate Inverse: Theory and Applications (2007)

Vol. 1907: M. Rasmussen, Attractivity and Bifurcation for Nonautonomous Dynamical Systems (2007)

Vol. 1908: T.J. Lyons, M. Caruana, T. Lévy, Differential Equations Driven by Rough Paths, Ecole d'Été de Probabilités de Saint-Flour XXXIV-2004 (2007)

Vol. 1909: H. Akiyoshi, M. Sakuma, M. Wada, Y. Yamashita, Punctured Torus Groups and 2-Bridge Knot Groups (I) (2007)

Vol. 1910: V.D. Milman, G. Schechtman (Eds.), Geometric Aspects of Functional Analysis. Israel Seminar 2004-2005 (2007)

Vol. 1911: A. Bressan, D. Serre, M. Williams, K. Zumbrun, Hyperbolic Systems of Balance Laws. Lectures given at the C.I.M.E. Summer School held in Cetraro, Italy, July 14–21, 2003. Editor: P. Marcati (2007)

Vol. 1912: V. Berinde, Iterative Approximation of Fixed Points (2007)

Vol. 1913: J.E. Marsden, G. Misiołek, J.-P. Ortega, M. Perlmutter, T.S. Ratiu, Hamiltonian Reduction by Stages (2007)

Vol. 1914: G. Kutyniok, Affine Density in Wavelet Analysis (2007)

Vol. 1915: T. Biyikoğlu, J. Leydold, P.F. Stadler, Laplacian Eigenvectors of Graphs. Perron-Frobenius and Faber-Krahn Type Theorems (2007)

Vol. 1916: C. Villani, F. Rezakhanlou, Entropy Methods for the Boltzmann Equation. Editors: F. Golse, S. Olla (2008)

Vol. 1917: I. Veselić, Existence and Regularity Properties of the Integrated Density of States of Random Schrödinger (2008)

Vol. 1918: B. Roberts, R. Schmidt, Local Newforms for $\mathrm{GSp}(4)$ (2007)

Vol. 1919: R.A. Carmona, I. Ekeland, A. Kohatsu-Higa, J.-M. Lasry, P.-L. Lions, H. Pham, E. Taffin, Paris-Princeton Lectures on Mathematical Finance 2004. Editors: R.A. Carmona, E. Çinlar, I. Ekeland, E. Jouini, J.A. Scheinkman, N. Touzi (2007)

Vol. 1920: S.N. Evans, Probability and Real Trees. Ecole d'Été de Probabilités de Saint-Flour XXXV-2005 (2008)

Vol. 1921: J.P. Tian, Evolution Algebras and their Applications (2008)

Vol. 1922: A. Friedman (Ed.), Tutorials in Mathematical BioSciences IV. Evolution and Ecology (2008)

Vol. 1923: J.P.N. Bishwal, Parameter Estimation in Stochastic Differential Equations (2008)

Vol. 1924: M. Wilson, Weighted Littlewood-Paley Theory and Exponential-Square Integrability (2008)

Vol. 1925: M. du Sautoy, Zeta Functions of Groups and Rings (2008)

Vol. 1926: L. Barreira, V. Claudia, Stability of Nonautonomous Differential Equations (2008)

Recent Reprints and New Editions

Vol. 1618: G. Pisier, Similarity Problems and Completely Bounded Maps. 1995 – 2nd exp. edition (2001)

Vol. 1629: J.D. Moore, Lectures on Seiberg-Witten Invariants. 1997 – 2nd edition (2001)

Vol. 1638: P. Vanhaecke, Integrable Systems in the realm of Algebraic Geometry. 1996 – 2nd edition (2001)

Vol. 1702: J. Ma, J. Yong, Forward-Backward Stochastic Differential Equations and their Applications. 1999 – Corr. 3rd printing (2007)

Vol. 830: J.A. Green, Polynomial Representations of GL_n , with an Appendix on Schensted Correspondence and Littelmann Paths by K. Erdmann, J.A. Green and M. Schocker 1980 – 2nd corr. and augmented edition (2007)