

Curriculum vitae

Roberto Artuso

Education

- HIGH SCHOOL DEGREE, 1977, Liceo Classico G. Berchet, Milano, grade: 60/60
- UNIVERSITY DEGREE (*Laurea* IN PHYSICS, February 1983, Università degli Studi di Milano, grade 110/110 cum laude (tesi: Studio dello stato stazionario per un modello rigoroso di conduzione del calore, Tutor: Prof. V. Gorini)
- PH.D. IN PHYSICS, Università degli Studi di Milano, Tutor: Prof. G. Casati)

Employments

- NOVEMBER 1988 - AUGUST 1991 Physics teaching - I.T.S.O.S. Technical High School - Milano – Research associate at National Institute of Nuclear Physics (I.N.F.N)
- AUGUST 1991 - JUNE 1993 Post Doctoral Fellow at Università degli Studi di Milano)
- JUNE 1993 - JULY 2000 Assistant Professor (*Ricercatore*) Università dell'Insubria - Polo di Como
- JULY 2000 - NOW Associate Professor Università dell'Insubria - Polo di Como

Main international collaborations

- P. CVITANOVIĆ, GEORGIA TECH, ATLANTA, U.S.A. Cycle expansions.
- D. SHEPELYANSKY, UNIVERSITÉ PAUL SABATIER, TOULOUSE, FRANCE, AND BUDKER INSTITUT FOR NUCLEAR PHYSICS, NOVOSIBIRSK, RUSSIA Quantum behaviour of classically chaotic hamiltonian maps. Breakup of tori with two frequencies.
- D. ALONSO, UNIVERSIDAD DE LA LAGUNA, SPAIN Nonequilibrium statistical mechanics and microscopic instability.
- C. MANCHEIN, UNIVERSIDAD DE CURITIBA, BRASIL Finite time Lyapunov exponents.
- X. LEONCINI, S. VAIENTI, CPT MARSEILLE, FRANCE Weak chaos, anomalous transport, central limit theorem.
- N. ANANIKYAN, YEREVAN UNIVERSITY, ARMENIA Dynamical systems methods in equilibrium statistical mechanics.

Courses taught

- 1993-2012 Statistical mechanics
- 1996-1999 Many bodies quantum theory
- 2001-2012 Mechanics of rigid bodies and fluids
- 2003-2012 Advanced statistical mechanics
- 2005-2006 Mathematical physics

General activities

- Scientific Secretary of “NATO Advanced Study Institute on Chaos, Order and Patterns”, Como 26 giugno - 7 luglio 1990.
- Referee for *J.Phys. A*, *Physica D*, *Nonlinearity*, *Europhys.Lett.*, *Phys.Rev.Lett.*, *Phys.Rev. E*, *Mathematical Reviews*, *Chaos*
- Organizer (together with Giulio Casati) of *XIX European Dynamics Days*, Como june 1999
- Member of the Scientific Committee *European Dynamics Days* (since 1998)
- Member of the organizing Committee *Quantum Chaos: Theory and Applications*, Como june 2003
- Member of the organizing Committee *Nonlinearities - From turbulent to magic*, Copenhagen may 2006
- Codirector of the workshop *Pseudochaos and stable-chaos in statistical mechanics and quantum physics*, Trieste september 2009
- Member of the Scientific Committee *Chaos, Complexity and Transport*, Marseille may 2011

Selected contributions to workshops

- Deterministic diffusion and cycle expansions, *Order-disorder transitions and criticality*, First IUPAP Topical Conference and the Second Taipei International Symposium on Statistical Physics, Taipei, Taiwan 1-7 August 1993
- Periodic orbit theory of anomalous diffusion, *121. WE-Heraeus Seminar: Applied Periodic Orbit Theory*, Bad Honnef, Germany 2-4 November 1993
- Fractal spectra in quantum chaos, *International Conference on Dynamical Systems and Chaos*, Tokyo, Japan 23-27 May 1994
- Correlation decay in billiards, *STATPHYS 19*, Xiamen, China 31 July - 4 August 1995

- Diamond billiards, *International Conference on Nonlinear Dynamics, Chaotic and Complex Systems*, Zakopane Poland 7-12 November 1995 item Triangular billiards, *WE-Heraeus Seminar: Physics and Dynamics between Chaos, Order and Noise*, Berlin, Germany 26-30 August 1996
- Scaling properties of spectra of classical and quantum systems, *International Conference on Frontiers in Quantum Physics*, Kuala Lumpur, Malaysia, 9-11 July 1997
- Correlation decay for weakly chaotic and intermittent systems, *ICMP '97* Brisbane, Australia, 13-19 July 1997
- Decay of correlations for weakly chaotic systems, *Patters, Non-linear Dynamics and Stochastic Behaviour in Spatially Extended, Complex Systems* Budapest, Hungary, 24-28 October 1997
- Weak chaos, *18 European Dynamics Days* Edinburgh, Scotland, 28 June - 1 July 1998
- Return time statistics, *Probabilistic and thermodynamic aspects of nonlinear dynamics* Brussels, Belgium, 14-17 July 1998
- Poincaré recurrences for area-preserving maps lacking complete hyperbolicity CATS Festival Copenhagen, Denmark, 8-12 December 1998
- Classical and quantum zeta functions and periodic orbits theory Course delivered at “New directions in quantum chaos”, CXLIII course *International School of Physics “Enrico Fermi”*, Varenna 20-30 July 1999
- Classical chaos and quantum transport, *INFM meeting*, Genova, May 2000
- From normal to anomalous diffusion, lectures delivered at the Summer School: *The Mathematical aspects of Quantum Chaos I*, Bologna, 1-10 September 2001
- Anomalous classical transport and quantum behavior, *Fundamental problems in quantum mechanics*, Tokyo 27-29 september 2001
- Some topics in weak chaos, *Quantum information, quantum computers and complex systems*, Tokyo 1-2 october 2001
- Normal and anomalous deterministic diffusion, *International workshop on chaotic transport and complexity in classical and quantum dynamics*, Carry le Rouet, 24-28 june 2002
- Weak chaos and anomalous transport, *FPU 50 anni da FPU*, Roma 7-8 may 2004
- Periodic orbit theory of transport, *International Workshop on Chaotic Transport and Complexity in Fluids and Plasmas* Carry le Rouet, 20-25 june 2004
- Weak chaos, *Dynamics Days 2004*, Palma de Mallorca 13-17 september 2004
- Weak chaos: correlations and transport, *Statistical mechanics, chaos and condensed matter theory* Roma 22-24 september 2004
- Caos debole: trasporto anomalo e funzioni zeta, *Proprietá statistiche dei sistemi dinamici e informazione*, Pisa 11-12 january 2005
- Deterministic chaotic transport, *Statistical systems out of equilibrium* Gold Coast 13 february 2006

- Periodic orbit theory of anomalous diffusion, *Fractional brownian motion: mathematical theory and application in finance* Sydney 21 february 2006
- Main concepts of equilibrium and nonequilibrium statistical mechanics, *Nonequilibrium statistical mechanics* Champex-Lac 6 march 2006
- Strongly anomalous deterministic transport, *373th Wilhelm und Else Heraeus Seminar* Bad Honnef, 14 july 2006
- Weak chaos: non perturbative techniques, *Statistical mechanics and non perturbative field theory* Bari 20 september 2006
- Deterministic transport: zeta functions techniques, *Chaos, Complexity and Transport*, Marseille 6 june 2007
- Weak chaos: dynamical effects, *XIII Convegno Nazionale di Fisica Statistica*, Parma 23-25 june 2008
- Large deviations for weak chaos, *3rd Workshop on Quantum Chaos: Theory and Applications*, Buenos Aires 1-4 december 2009
- Stickiness, correlations and large deviations, *Anomalous transport: from billiards to nanosystems*, Sperlonga 20-24 September 2010
- Dynamical features of weakly chaotic and non-chaotic systems, *Chaos, complexity and transport*, Marseille 23-27 May 2011
- Dynamical features of weak chaos, *Weak chaos, infinite ergodic theory and anomalous dynamics*, Dresden 25 July-12 August 2011
- Large deviations for intermittent systems, *Dynamics Days 2012*, Gothenburg 2-7 July 2012

Research themes

- MICROSCOPIC THEORY OF HEAT CONDUCTION (P. nr. [1, 3, 17, 41])
(collaborations with D. Alonso, V. Benza, G. Casati, A. Frigerio, V. Gorini, I. Guarneri and E. Montaldi)
- QUASIPERIODIC TRANSITIONS TO CHAOS AND THERMODYNAMIC FORMALISM (P. nr. [2, 18, 19, 15])
(collaborations with P. Cvitanović and B. Kenny)
- CYCLE EXPANSIONS (P. nr. [2, 9, 20, 21, 15, 10, 11, 49])
(collaborations with E. Aurell, P. Cvitanović and G. Tanner)
- TRANSITION TO CHAOS IN VOLUME-PRESERVING MAPS (P. nr. [22, 24])
(collaborations with G. Casati and D. Shepelyansky)
- DETERMINISTIC DIFFUSION AND PERIODIC ORBITS THEORY (P. nr. [23, 27, 30, 31, 36, 15, 38, 46, 11, 47, 12, 50, 13, 14])
(collaborations with G. Casati, G. Cristadoro, P. Cvitanović, R. Lombardi and G. Tanner)

- FRACTAL SPECTRA AND DYNAMICAL PROPERTIES OF QUANTUM SYSTEMS (P. nr. [5, 6, 7, 25, 26, 28, 29, 45, 48, 51, 56, 16])
(collaborations with D. Belluzzo, F. Borgonovi, S. Fishman, G. Casati, I. Guarneri, L. Rebuzzini, D. Shepelyansky and S. Wimberger)
- CHAOTIC BILLIARDS (P. nr. [8, 32, 33, 34, 35])
(collaborations with G. Casati, P. Dahlqvist and I. Guarneri)
- POLYGONAL BILLIARDS (P. nr. [7, 37, 39, 43, 63])
(collaborations with G. Casati, I. Guarneri and L. Rebuzzini)
- WEAK CHAOS, CORRELATION FUNCTIONS AND RETURN TIME STATISTICS (P. nr. [40, 42, 44, 58]) (collaboration with L. Cavallasca, G. Cristadoro, A. Prampolini and M. Rusconi)
- DIRECTED TRANSPORT (P. nr. [14, 53, 55]) (collaborations with L. Cavallasca and G. Cristadoro)
- QUANTUM ACCELERATOR MODES (P. nr. [56, 59]) (collaborations with S. Fishman, I. Guarneri and L. Rebuzzini)
- DYNAMICAL SYSTEMS METHODS IN EQUILIBRIUM STATISTICAL MECHANICS (P. nr. [54, 57, 61, 62]) (collaboration with N. Ananikian, L. Ananikyan, V. Hovhannisyanyan and K. Sargsyan)
- STABILITY ANALYSIS AND CORRELATION BEHAVIOR (P. nr. [60]) (collaboration with C. Manchein)
- GEOMETRIC FEATURES OF LOW AND HIGH DIMENSIONAL HAMILTONIAN SYSTEMS, OSLEDETS' SPLITTING AND COVARIANT LYAPUNOV VECTORS (P. nr. [64, 65, 66]) (collaborations with C. Manchein, M. Sala and A. Turchi)

Papers

THESES

1. R. Artuso: Studio dello stato stazionario per un modello rigoroso di conduzione del calore, *Tesi di Laurea*, Università degli Studi di Milano, 1983
2. R. Artuso: Scale e cicli per insiemi strani, *Tesi di Dottorato*, Università degli Studi di Milano, 1989

CONTRIBUTED PAPERS, WORKSHOPS, BOOKS

3. R. Artuso e V. Gorini: On the Stationary State for a Model of Heat Conduction, in C. Boldrighini, G.F. Dell'Antonio, G. Jona-Lasinio, A. Pellegrinotti e L. Triolo (eds) *Italian-Soviet Symposium on Mathematical Problems of Statistical Physics*, Servizio Documentazione dei Laboratori Nazionali di Frascati I.N.F.N., 1983
4. R. Artuso, P. Cvitanović e G. Casati (eds): *Chaos, Order and Patterns*, Plenum, 1991 New York
5. R. Artuso e G. Casati, Thermodynamic Formalism of Quasienergy Spectra, *Atti del Convegno "From Classical to Quantum Chaos"*, in Proc. Sif, edited by G.F. Dell'Antonio, S. Fantoni, and V.R. Manfredi, Vol. **41** (Editrice Compositori, Bologna, 1993)
6. R. Artuso, D. Belluzzo and G. Casati, Strange measures in quantum chaos, in *Dynamical Systems and Chaos, Vol. 2*, edited by Y. Aizawa, S. Saito and K. Shiraiwa, (World Scientific, Singapore, 1995)
7. R. Artuso, Weak correlation decay in classical and quantum systems, in S.C. Lim, R. Abd-Shukor and K.H. Kwek (eds) *Frontiers in Quantum Physics*, Springer, Singapore 1998
8. R. Artuso, Chaos in confined systems: classical billiards, in E. Fois and A. Gamba (eds), *IV Convegno Nazionale Scienza e Tecnologia delle Zeoliti, proceedings*, Centro A. Volta, Como, 1998
9. R. Artuso, Periodic orbit theory for classical chaotic systems, contributo a H.G. Schuster (ed) *Handbook of Chaos Control: Foundations and Applications* J. Wiley (1999)
10. R. Artuso, Classical and quantum zeta functions and periodic orbits theory, in G. Casati, I. Guarneri and U. Smilansky (eds) *New Directions in Quantum Chaos, Proceedings of the International School of Physics "Enrico Fermi"*, Course CXLIII, IOP Press, Amsterdam 2000
11. R. Artuso, From normal to anomalous deterministic diffusion, in M. Degli Esposti and S. Graffi (eds) *The mathematical aspects of quantum chaos*, Springer *Lect. Notes Phys.* **618** 2003
12. R. Artuso, Weak chaos: classical and quantum features, in L. Accardi and S. Tasaki (eds), *Fundamental aspects of quantum physics*, World Scientific, Singapore 2003
13. R. Artuso and G. Cristadoro, Deterministic (anomalous) transport, in R. Klages, G. Radons, I.M. Sokolov (Eds.), *Anomalous Transport: Foundations and Applications*, Wiley-VCH, Berlin, 2008

14. R. Artuso, L. Cavallasca and G. Cristadoro, Transport in deterministic ratchets: periodic orbit analysis of a toy model, in C. Chandre (Ed.), *Chaos, Complexity And Transport: Theory and Applications* World Scientific, Singapore, 2008
15. P. Cvitanović, R. Artuso, R. Mainieri, G. Tanner and G. Vattay, *Chaos: Classical and Quantum*, ChaosBook.org (Niels Bohr Institute, Copenhagen 2009)
16. R. Artuso, Kicked Harper Model, *Scholarpedia* **6(10)** (2011) 10462
REGULAR PAPERS, PREPRINTS
17. R. Artuso, V. Benza, A. Frigerio, V. Gorini e E. Montaldi: The Stationary State and the Heat Equation for a Variant of Davies' Model of Heat Conduction, *J.Stat.Phys* **38** (1985) 1051
18. R. Artuso: Logarithmic Strange Sets, *J.Phys* **A21** (1988) L923
19. R. Artuso, P. Cvitanović e B.G. Kenny: Phase Transitions on Strange Irrational Sets, *Phys.Rev.* **A39** (1989) 268 [36]
20. R. Artuso, E. Aurell e P. Cvitanović, Recycling of Strange Sets: I. Cycle Expansions, *Nonlinearity* **3** (1990) 325[325]
21. R. Artuso, E. Aurell e P. Cvitanović, Recycling of Strange Sets: II. Applications, *Nonlinearity* **3** (1990) 361 [211]
22. R. Artuso, G. Casati e D.L. Shepelyansky, Breakdown of Universality in Renormalization Dynamics for Critical Invariant Torus, *Europhys.Lett.* **15** (1991) 381 [16]
23. R. Artuso, Diffusive Dynamics and Periodic Orbits of Dynamical Systems, *Phys.Lett.* **A 160** (1991) 528 [42]
24. R. Artuso, G. Casati e D.L. Shepelyansky: Breakup of the Spiral Mean Torus in a Volume-Preserving Map, *Chaos, Solitons and Fractals* **2** (1992) 181
25. R. Artuso, G. Casati e D.L. Shepelyansky, Fractal Spectrum and Anomalous Diffusion in the Kicked Harper Model, *Phys.Rev.Lett.* **68** (1992) 3826 [63]
26. R. Artuso, F. Borgonovi, I. Guarneri, L. Rebuzzini e G. Casati, Phase Diagram in the Kicked Harper Model, *Phys.Rev.Lett.* **69** (1992) 3302 [46]
27. R. Artuso, G. Casati e R. Lombardi, Periodic Orbit Theory of Anomalous diffusion, *Phys.Rev.Lett.* **71** (1993) 62 [46]
28. R. Artuso, D. Belluzzo and G. Casati, Thermodynamic analysis of the spectral measure for kicked quantum systems, *Europhys.Lett.* **25** (1994) 181
29. R. Artuso, G. Casati, F. Borgonovi, L. Rebuzzini and I. Guarneri, Fractal and dynamical properties of the kicked Harper model, *Int.J.Mod.Phys.* **B8** (1994) 207 [44]
30. R. Artuso, G. Casati and R. Lombardi, Periodic orbit theory of deterministic diffusion, *Physica* **A205** (1994) 412
31. R. Artuso, Recycling deterministic diffusion, *Physica* **D76** (1994) 1

¹Numbers in red, enclosed in square brackets, report, for the most cited papers, the number of citations according to *Web of Science*, November 2012. Total citation number is [1208].

32. R. Artuso, G. Casati and I. Guarneri, Geometric scaling of correlation decay in chaotic billiards, *Phys.Rev.* **E51** (1995) R3807 [11]
33. P. Dahlqvist and R. Artuso, On the decay of correlations in Sinai billiards with infinite horizon, *Phys.Lett.* **A219** (1996) 212 [23]
34. R. Artuso, G. Casati and I. Guarneri, Numerical experiments on billiards, *J.Stat.Phys.* **83** (1996) 145 [19]
35. R. Artuso, Correlation Decay in Diamond Billiards, *J.Tech.Phys.* **37** (1996) 273
36. R. Artuso, Anomalous diffusion in classical dynamical systems, *Phys.Rep.* **290** (1997) 37 [16]
37. R. Artuso, Correlation and spectra of triangular billiards, *Physica* **D109** (1997) 1
38. R. Artuso and R. Strepparava, Recycling diffusion in sawtooth and cat maps, *Phys.Lett.* **A236** (1997) 469 [11]
39. R. Artuso, G. Casati and I. Guarneri, Numerical study on ergodic properties of triangular billiards, *Phys.Rev.* **E55** (1997) 6384 [40]
40. R. Artuso and A. Prampolini, Correlation decay for an intermittent area-preserving map, *Phys.Lett. A* **246** (1998) 407 [13]
41. D. Alonso, R. Artuso, G. Casati and I. Guarneri, Heat conductivity and dynamical instability, *Phys.Rev.Lett.* **82** (1999) 1859 [73]
42. R. Artuso, Correlation decay and return time statistics, *Physica D* **131** (1999) 68 [17]
43. R. Artuso, I. Guarneri e L. Rebuzzini, Spectral properties and anomalous transport in a polygonal billiard, *Chaos* **10** (2000) 189 [14]
44. R. Artuso e M. Rusconi, Asymptotic quantum behavior of classically anomalous maps, *Phys.Rev.* **E64** (2001) 015204(R)
45. R. Artuso e L. Rebuzzini, Nonlinearity effects in the kicked oscillator. *Phys.Rev.* **E66** (2002) 017203
46. R. Artuso and G. Cristadoro, Anomalous transport: a deterministic approach, *Phys.Rev.Lett.* **90** (2003) 244101 [10]
47. R. Artuso e G. Cristadoro, Weak chaos and anomalous transport: a deterministic approach, *Commun.Nonl.Sci.Numer.Sim.* **8** (2003) 137
48. R. Artuso e L. Rebuzzini, Effects of a nonlinear perturbation of dynamical tunneling in cold atoms, *Phys.Rev.* **E68** (2003) 036221
49. R. Artuso, P. Cvitanović e G. Tanner, Cycle expansions for intermittent maps, *Progr.Theor.Phys.* **150** (2003) 1
50. R. Artuso e G. Cristadoro, Periodic orbit theory of strongly anomalous transport, *J.Phys* **A** **37** (2004) 85 [14]
51. L. Rebuzzini, S. Wimberger and R. Artuso, Delocalized and resonant quantum transport in nonlinear generalizations of the kicked rotor model, *Phys.Rev. E* **71** (2005) 036220 [11]

52. R. Artuso and G. Cristadoro, Anomalous deterministic transport, *Chaos* **15** (2005) 015116
53. R. Artuso, L. Cavallasca e G. Cristadoro, Recycling Parrondo games, *J.Phys.* **A 39**, (2006) 1285
54. N. Ananikian, L. Ananikyan and R. Artuso, Multi-dimensional mapping and folding properties for non-classical helix-stabilizing interaction of proteins, *Phys.Lett.* **A 360** (2007) 615
55. L. Cavallasca, R. Artuso and G. Casati, Directed deterministic classical transport: symmetry breaking and beyond, *Phys.Rev.E* **75** (2007) 066213
56. L. Rebuzzini, R. Artuso, I. Guarneri and S. Fishman, Effects of atomic interactions on quantum accelerator modes, *Phys.Rev.A* **76** (2007) 031603(R) [\[12\]](#)
57. N. Ananikian, L. Ananikyan, R. Artuso K. Sargsyan, The partition function zeros for a Potts model of helix-coil transition with three-site interactions, *Physica A* **387** (2008), 5433
58. R. Artuso, L. Cavallasca and G. Cristadoro, Dynamical and transport properties in a family of intermittent area-preserving maps, *Phys.Rev.* **E77**, 046206 (2008)
59. L. Rebuzzini, I. Guarneri and R. Artuso, Spinor dynamics of quantum accelerator modes near higher order resonances, *Phys.Rev.* **A79**, 033614 (2009)
60. R. Artuso and C. Manchein, Instability statistics and mixing rates, *Phys.Rev.* **E80**, 036210 (2009)
61. N.S. Ananikian, L.N. Ananikyan, R. Artuso and V.V. Hovhannisyan, One dimensional mapping, Arnold tongues and Lyapunov exponent for the antiferromagnetic Q state Potts model and multi-site exchange interaction Ising model, *Physica D* **239**, 1723 (2010)
62. N. Ananikian, L. Ananikyan, R. Artuso and H. Lazaryan, Magnetization and Lyapunov exponents on a kagome chain with multi-site exchange interaction, *Phys.Lett. A* **374**, 4084 (2010)
63. L. Rebuzzini and R. Artuso, Higher order statistics in the annulus square billiard: transport and polyspectra, *J.Phys. A* **44**, 025101 (2011)
64. M. Sala, C. Manchein and R. Artuso, Estimating hyperbolicity of chaotic bidimensional maps, *Int.J.Bifurcations & Chaos*, **22**, 1250217 (2012)
65. M. Sala and R. Artuso, Explicit Oseledets' splitting for Standard-like maps, submitted 2012 [ArXiv:1203.4187](#)
66. M. Sala, A. Turchi and R. Artuso, Oselets' splitting in Large Hamiltonian Systems: the HMF Phase Transition, submitted 2012 [ArXiv:1207.0522](#)