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Biography

Giorgio Mantica was born in Milano on January 4, 1960. He received his degree in Physics, cum laude, from the University of Pavia in 1982, where he was fellow of Collegio Ghislieri, and his Ph.D. in Theoretical Physics from the University of Milano in 1986.

From 1984 to 1989 he was a Research Associate and Postdoctoral Fellow at the Georgia Institute of Technology in Atlanta, Georgia U.S.A., working on research contracts funded by the Dept. of Energy and the National Science Foundation. From 1987 to 1989 he was also on the faculty of the Clark Atlanta University in Atlanta, Ga. From 1989 to 1991 he was a Visiting Scientist at the Service de Physique Theorique of the Commissariat a' l'Energie Atomique in Saclay, France.

From 1992 to 1994 he was on the faculty of the Graham School of Management of the Saint Xavier University of Chicago, IL, U.S.A., with special duties for the newly instituted Milan campus. In 1994 he got a position as Researcher in Mathematical Analysis at the University of Milano, Department of Mathematics, and the following year he moved to the Institute of Mathematics and Physics at Como. Since 2001 he has been an Associate Professor of Mathematical Physics at the University of Insubria in Como.

He has been invited repeatedly to speak and research at the Georgia Institute of Technology in Atlanta, the Commissariat à l'Energie Atomique in Saclay, the Centre de Physique Theorique in Marseille, l'Université de Toulon et du Var, the Queen Mary College of the University of London, the Max Planck Institute in Dresden, and l'Université Libre de Bruxelles. He has also visited for shorter periods l'Université du Quebec à Montreal, l'Observatoire de Nice, and the Niels Bohr Institute in Copenhagen.

Qualifications and awards

He was awarded a Fulbright Fellowship in 1983.

He has directed or participated in various research programs, funded by the U.S. Department of Energy, the U.S. National Science Foundation, the Commission of European Communities, and E.N.E.A. (Ente per le Nuove Tecnologie; l'Energia e L'Ambiente).

He has also organized several international research conferences, holding grants from Nato, the European Science Foundation, and the U.S. Army Research Office, the most recent of which being “Quantum Chaos: Theory and Applications”, held in June 2004.

He has been an invited speaker at several international conferences, the most recent of which being Dynamics Days Europe 2003.

Research interests

His research interests are in the field of dynamical systems and chaos, both classical and quantum. He is also interested in the theory of fractal measures, in orthogonal polynomials and their Fourier transforms and in numerical analysis.

In quantum dynamics, he has studied the problem of the so-called “quantum chaos” from an information-theoretical viewpoint, the motion of quantum systems in strong external fields, and random matrix theory. He has devised a constructive technique for deriving semiconductor super-lattices possessing prescribed spectral properties. He has introduced the concept of “quantum intermittency” to describe the motion of quantum systems with singular continuous spectral measures, and he has derived an exact formula for the intermittency function of systems with Julia set spectral measures, that involves the multi-fractal dimensions of the latter. He has shown the relevance of quantum intermittency in the wave propagation in almost periodic systems.

In mathematical analysis, he has studied the exponential of random matrices, the asymptotics of the Fourier transforms of orthogonal polynomials, and the distribution of zeros of Szego polynomials with random coefficients.

In numerical analysis, he has developed techniques based on the theory of moments for the exact quantization of periodic Schroedinger operators, and for the exact calculation of scattering amplitudes. He has devised numerical techniques for the solution of a family of inverse problems in fractal construction, for the stable computation of the Jacobi matrices associated with singular continuous measures, and for the Fourier transforms of the associated orthogonal polynomials.

In classical dynamics, he has studied the multifractal measures arising from the symbolic dynamics of motions in spaces of negative curvature. He has derived exact relations between the statistics of Poincare’ recurrences and the multi-fractal analysis of the invariant measures of dynamical systems. He has characterized the algorithmic complexity of dynamical motions in polygonal billiards, and in discrete systems subject to random perturbations.

He has devised new families of generalized Apollonian packing of spheres, and studied efficient numerical algorithms for their construction based on group theory and hyperbolic geometry.

Teaching experience and appointments

G.M. has been teaching basic and advanced courses in three languages in all the various institutions where he has held positions. His teaching has covered topics in theoretical physics, mathematical analysis, linear algebra, probability and

statistics, and numerical analysis.

He has participated as elected member of the Academic Senate to the redaction of the University Statute. Since 2001 he sits in the Committee for the distribution of the University research funds in the class of Mathematics, Economics, and Informatics.

Representative publications

G. Casati, I. Guarneri and G. Mantica, Random Matrices as Models for the Statistics of Quantum Mechanics *Physica D* 21, 105 (1986).

G. Mantica, Quantum Resonances and Strong Field Ionization, *IEEE Journal of Quantum Elect.* 24, 1453-1460 (1988).

G. Mantica and A. Sloan, Chaotic Optimization and the Construction of Fractals, *Complex Systems* 3, 37-72 (1989).

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S. Bullett and G. Mantica, Group Theory of Hyperbolic Circle Packings , *Nonlinearity* 5, 1085-1109 (1992). J. Ford and G. Mantica, Does Quantum Mechanics Obey the Correspondence Principle ? Is It Complete ? *Am. J. Phys.* 60, n. 12 (1992).

G. Mantica and B. Giraud, Nonlinear Forecasting and Iterated Function Systems, *Chaos* 2, 225-230 (1992).

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- I. Guarneri and G. Mantica, Multifractal Energy Spectra and their Dynamical Implications, *Phys. Rev. Lett.* 73, 3379-3382 (1994).
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- G. Mantica, A Stable Stieltjes Technique to Compute Jacobi Matrices Associated with Singular Measures, *Constructive Approximation* 12, 509-530 (1996).
- G. Mantica, Quantum Intermittency in Almost-Periodic Lattice Systems derived from their Spectral Properties, *Physica D* 103, 576 (1997).
- F. Aaron, D. Bessis, J.D. Fournier, G. Mantica, and G.A. Mezincescu, Distribution of Roots of Random Real Generalized Polynomials, *J. Stat. Phys.* 86, 675-705 (1997).
- D. Bessis, G. Mantica, G.A. Mezincescu, and D. Vrinceanu, Electron Wave Filters from Inverse Scattering Theory, *Europhysics Letters* 37, 151-156 (1997).
- G. Mantica, Wave Propagation in Almost Periodic Structures, *Physica D* 109, 113-127 (1997).
- G. Mantica, Quantum Intermittency: Old or New Phenomenon? *J. Phys. IV France* 8, 253 (1998).
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- G. Mantica, On Computing Jacobi Matrices associated with Recurrent and Moebius Iterated Functions Systems, *J. Comp. and Appl. Math.* 115, 419-431 (2000).
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- G. Casati, G. Mantica, and D.L. Shepelyansky, Regular and Anomalous Quantum Diffusion in the Fibonacci Kicked Rotator, *Phys. Rev. E* 63, 066217 (2001).
- N. Hadyn, J. Luevano, G. Mantica, S. Vaienti, Multifractal properties of return time statistics, *Phys. Rev. Lett.* 88, 224502 (2002).
- M. Falcioni, G. Mantica, S. Pigolotti, A. Vulpiani, Coarse Grained Probabilistic Automata Mimicking Chaotic Systems, *Phys. Rev. Lett.* 91, 044101 (2003).

Clinical interests

G.M. is actively interested in the dynamical systems approach to physiology,

training and cycling performance.