

Enrico Scalas

Born: 11/01/1964

Italian citizen

Address:

Università del Piemonte Orientale

Dipartimento di Scienze e Tecnologie Avanzate

Viale T. Michel 11

15121 Alessandria, Italy

phone: +39 0131 360170, fax: +39 0131 360199

e-mail: enrico.scalas@mfn.unipmn.it

web pages: www.mfn.unipmn.it/~scalas, www.fracalmo.org

links to preprints and working papers: <http://ideas.repec.org/e/psc89.html>;

http://arxiv.org/find/grp_physics/1/au:+Scalas_Enrico/0/1/0/all/0/1

Education:

1994: PhD in Physics, Physics in 2d, diffusion and growth of aggregates. Advisors: Andrea C. Levi and Alessandra Gliozzi.

1989: Degree in Physics, Dynamics of the gel-to-liquid crystal phase transition in lipid systems. Advisors: Andrea C. Levi and Alessandra Gliozzi.

Professional Experience:

Current position

1998 to present: *Assistant Professor* of Physics at Università del Piemonte Orientale, Italy.

Visiting professorships

October-November 2010: *Visiting Scientist* at Departament d'Economia, Universitat Jaume I, Castellón de la Plana, Spain.

November 2006: *Visiting Professor* at Division of Social Sciences, International Christian University, Tokyo, Japan.

2005 September to 2006 August: *Senior researcher* at the Multi-Agent Division of ISI, Turin, Italy.

November/December 2005: *Visiting Professor* at Department of Applied Mathematics, Research School for Physical Sciences and Engineering, Australian National University, Canberra, Australia.

Postdoctoral grants

1997-1998: *Post-doc* at INFM (Italian Institute for the Physics of Matter), Genoa, Italy.

1995-1997: *Post-doc* at the Physics Department, Genoa University, Italy.

1994-1995: *Post-doc* at the Institute of Physical Chemistry, Mainz University, Germany, in the group of Prof. Dr. Helmuth Möhwald.

Research activities:

Past research:

1990-1998:

Physical properties of surfactant monolayers at the air-water interface, with emphasis on phase transitions. This included experimental work at synchrotron radiation facilities.

Theory of diffusion in lattice-gas models of solid surfaces.

1998-2002:

Heavy-ion physics. This included experimental work at CERN.

Current research:

Anomalous diffusion and its applications to complex systems. This includes the application of Fractional Calculus and Continuous-Time Random Walks to Finance. Started in 1999, this research line has been very successful in two respects: it has given rise to a series of papers on the waiting-time properties in financial markets by other independent authors and to a long series of theoretical and empirical work.

Foundations of Statistical Mechanics. This includes activity on the Ehrenfest Urn model and investigations on the role of statistical equilibrium in Physics and Economics

Agent-based simulations in Physics, Finance and Economics. This includes the application and validation of large-scale simulations to complex systems in different scientific fields.

Highlights

A short description of some recent results obtained by Enrico Scalas is included below.

1. In 1998, Enrico proposed the use of continuous-time random walks as a model for tick-by-tick financial data. Relevant paper: SCALAS E, GORENFLO R, MAINARDI F. (2000). Fractional calculus and continuous-time finance. PHYSICA. A. vol. 284, pp. 376-384.
2. In 2003, Enrico introduced a Mittag-Leffler generalization of the Poisson process. Relevant papers: SCALAS E, GORENFLO R, MAINARDI F. (2004). Uncoupled continuous-time random walks: Solution and limiting behavior of the master equation. PHYSICAL REVIEW E, STATISTICAL, NONLINEAR, AND SOFT MATTER PHYSICS. vol. 69, 011107. MAINARDI F., GORENFLO R. and SCALAS E. (2004): A fractional generalization of the Poisson process, Vietnam Journal of Mathematics 32 (SI), 53–64. E-print: arxiv.org/abs/math/0701454.

3. In 2007, Enrico showed that Markovianism is compatible with classical dynamics. Relevant paper: SCALAS E., MARTIN E, GERMANO G. (2007). Ehrenfest urn revisited: Playing the game on a realistic fluid model. PHYSICAL REVIEW E, STATISTICAL, NONLINEAR, AND SOFT MATTER PHYSICS. vol. 76, 011104.
4. In 2009, Enrico showed that the quadratic variation for an important class of continuous-time random walks (compound renewal processes) is related to the M-functions of Wright type. Relevant paper: GERMANO G, POLITI M, SCALAS E., SCHILLING R.L (2009). Stochastic calculus for uncoupled continuous-time random walks. PHYSICAL REVIEW E, STATISTICAL, NONLINEAR, AND SOFT MATTER PHYSICS, vol. 79, 066102.

Proposal evaluation:

Evaluator of research proposals for the following countries: Colombia, Finland, France, Estonia, Israel, The Netherlands

Research grants:

July 2003 – July 2007: *Ultra-high frequency dynamics of financial markets*

February 2007- March 2009: *Information filtering in gene expression from DNA-microarray experiments.*

December 2008- December 2009: *Biofuel production from the viewpoint of complex systems.*

Some academic co-workers:

Tomaso Aste at the School of Physical Sciences, University of Kent, Canterbury, UK.

Tiziana Di Matteo at King's College, London, UK.

Ubaldo Garibaldi at IMEM-CNR, Genoa, Italy.

Guido Germano at the Institute of Physical Chemistry, Marburg University, Germany.

Rudolf Gorenflo at the First Mathematical Institute, Free University of Berlin, Germany.

Alejandro Raul Hernandez Montoya at Universidad Veracruzana, Xalapa, Mexico.

Jun-Ichi Inoue at Complex Systems Engineering, Graduate School of Information Science & Technology, Hokkaido University, Sapporo, Japan.

Taisei Kaizoji at Economics Division of Social Sciences, International Christian University, Tokyo, Japan.

Francesco Mainardi at the Physics Department, Bologna University, Italy.

Mark M. Meerschaert at the Department of Statistics and Probability, Michigan State University, USA.

Fabio Rapallo at DISTA, East Piedmont University, Italy.

René Schilling at the Institute for Mathematical Stochastic, Technical University Dresden, Germany.

Students

Among the students whom he has totally or partially advised there are:

Gilles Daniel, Market Risk Analyst, Emerging Markets, UBS Investment Bank, Zurich, Switzerland.

Giancarlo Mosetti, Quantitative Analyst at FMR Consulting, Voghera, Italy.

Mauro Politi, Postdoctoral fellow, International Christian University, Tokyo, Japan.

Marco Raberto, Assistant Professor, School of Science and Engineering, Reykjavik University, Iceland.

Bence Toth, Postdoctoral fellow, Santa Fe Institute, Santa Fe, NM, USA.

Editorial activity:

Journals:

He is a member of the editorial board of the *Journal of Economic Interaction and Coordination*: <http://www.es-hia.org/magazine/> and he joined the Society for Economic Science with Heterogeneous Interacting Agents

He is an academic editor of the open access Journal *PLoS ONE*:
<http://www.plosone.org/home.action>

In September 2004, in Alessandria, he has organized a conference devoted to young researchers: the First Bonzenfreies Colloquium on Market Dynamics and Quantitative Economics. He has been a guest editor of the special issue of *Physica A* devoted to this conference. The volume has been published as:

Physica A Volume 355, Issue 1, Pages 1-232 (1 September 2005)
Market Dynamics and Quantitative Economics; Selection of papers presented at the First Bonzenfreies Colloquium on Market Dynamics and Quantitative Economics, 09-10 September 2004
Edited by Enrico Scalas

He has been a guest editor of a second *Physica A* volume published in 2007:

Physica A Volume 383, Issue 1, Pages 1 – 169 (1 September 2007)
Proceedings of the 2006 edition of the Econophysics Colloquium and the Bonzenfreies Colloquium, 23-25 November 2006
Edited by Taisei Kaizoji, Akira Namatame and Enrico Scalas

Together with Taisei Kaizoji and Akira Namatame, he has been a guest editor of a special issue of the *Journal of Economic Interaction and Coordination* in which ten papers appear discussed at the 2006 Econophysics Colloquium which was held in Tokyo at the International Christian University (ICU) in November 2006.

Currently, the issue is available on-line: <http://www.springerlink.com/content/120105/>

Referee

He has served as a referee for the following journals: *Physica A*, *Physical Review E*, *Physical Review Letters*, *International Journal of Physics A: Mathematical and Theoretical*, *European Journal of Physics B*, *Advances in Complex Systems*, *Journal of Economic Dynamics and Control*, *Journal of Economic Behavior and Organization*, *Quantitative Finance*, *Journal of Economic Interaction and Coordination*, *PLoS ONE*, *Economics e-journal*, *Journal of Evolutionary Economics*. He is a reviewer for *Mathematical Reviews*.

Organization of conferences and workshops:

He has recently been a member of the Scientific and/or Organizing Committee of the following conferences:

Econophysics Colloquium, Canberra, Australia, 14 - 18 November 2005;

<http://www.rsphysse.anu.edu.au/econophysics/index.php>

Fractal 2006, Vienna, Austria, 12 – 15 February 2006;

<http://www.kingston.ac.uk/fractal/>.

Econophysics Colloquium 2006 and Third Bonzenfreies Colloquium, Tokyo, Japan, 23 – 25 November 2006;

<http://subsite.icu.ac.jp/ssri/EconophysicsColloquium2006/EconophysicsColloquium.html>

ESHIA School on Agent Based Models for Spatial Systems in Social Sciences and Economic Science with Heterogeneous Interacting Agents, La Londe les Maures, Var, France. 17 – 22 September 2007.

<http://perso.univ-rennes1.fr/denis.phan/laLonde/>

Econophysics Colloquium 2007 and Beyond, Ancona, Italy, 27 – 29 September 2007;

<http://econophysics.econ.univpm.it/>

Artificial Economics 2008, Innsbruck, Austria, 12-13 September 2008;

<http://www.uibk.ac.at/ibf/ae08/>

New Trends in Science and Technology, Ankara, Turkey, 03-04 November 2008;

<http://ntst08.cankaya.edu.tr/index.html>

3rd IFAC Workshop on Fractional Differentiation and its Applications, Ankara, Turkey, 05-07 November, 2008; <http://fda08.cankaya.edu.tr/index.html>

Econophysics Colloquium 2009, Erice, Italy, 25-31 October 2009,

<http://pil.phys.uniroma1.it/~gcalda/EC2009/>.

ESHIA/WEHIA 2010, Alessandria, Italy, 23-25 June 2010;

<http://sites.google.com/site/eshia2010/home>.

MAFIN 2010, Reykjavik, Iceland, 23-25 September 2010;

<http://sites.google.com/site/mafin2010/>

4th IFAC Workshop on Fractional Differentiation and its Applications, Badajoz, Spain, 18-20 October 2010; <http://web.tuke.sk/fda10/index.html>.

Invited talks

Recent invited talks were presented at the following international meetings:

Econophysics: Trends & Challenges, Niels Bohr Institute, Copenhagen, Denmark, 08-09 May 2008.

New Trends in Science and Technology, Çankaya University, Ankara, Turkey, 03-04 November 2008.

3rd IFAC Workshop on Fractional Differentiation and its Applications, Çankaya University, Ankara, Turkey, 05 - 07 November, 2008.

Workshop on kinetic and macroscopic modeling for socio-economic and related problems Vigevano, Italy, 27-29 November 2008.

Workshop on Jump Processes - JUMPS 09, Technische Universität Dresden, Germany, 15-17 January 2009.

MAFIN '09 (First International Workshop on Managing Financial Instability in Capitalistic Economies), Reykjavik, Iceland, 3-5 September 2009.

4th IFAC Workshop on Fractional Differentiation and its Applications, Special session on *Fractional Calculus: Basic Theory and Neighbouring Fields*, dedicated to Professor emeritus Rudolf Gorenflo (FU Berlin) on the occasion of his 80th anniversary. University of Extremadura, Badajoz, Spain, October 18-20, 2010.

Teaching:

Since 1998, he has introduced the elements of modern Statistical Mechanics in the curriculum of undergraduate Physics students at East Piedmont University. From 1998 to 2002, he has taught a course of exercises on Condensed Matter Structure. From 2003, he has taught an introductory course in modern statistical mechanics, based on the book of Julia M. Yeomans, *Statistical Mechanics of Phase Transitions*, Clarendon 1992. Moreover, since 2002, he has taught other two courses: an introductory course on measurement theory, probability and statistics for Materials Science students and an introductory course in Physics for Computer Science students. He is currently teaching courses in Econophysics where he usually presents an introduction to stochastic processes and the valuation of derivatives.

Courses:

In January 2003, he has taught an introductory course on *Semiconductor Physics* to French students at the IUT in Montluçon, France.

In October 2008, he has taught a course on *Probability for Economists* for the Ph.D students of the International Doctoral Program in Economics at Sant'Anna School of Advanced Studies in Pisa, Italy.

In February 2010, he has taught a course on *Stochastic Processes in Finance* for physics Ph.D Students at Pavia University, Italy.

Vision and mission

Enrico Scalas strongly believes in the quantitative effectiveness of probabilistic and statistical methods applied to exciting research fields which have often been the realm of qualitative, even if sophisticated, analyses and researches, including Biology, Economics, Finance and History. He has established an interdisciplinary and international research group working both empirically and theoretically on the full spectrum of complex systems.

Other activities

He has been a member of Amnesty International since 1982.

He is also a supporter of two Italian NGOs: Emergency (www.emergency.it) providing life support to civilian war victims through emergency surgery and CICAP (www.cicap.it), an Italian skeptical organization promoting science and rational thought.

Languages

Italian: mother tongue

English: good working knowledge in all the language aspects;

French: he can speak and read French;

German: he can speak and read German;

With the help of a dictionary, he can read and translate documents written in Spanish, Portuguese, Dutch, Swedish, Danish and Norwegian.

Enrico Scalas: List of publications

Bibliometric data

At present, Enrico Scalas is co-author of 90 published peer-review papers with 1304 citations as of June 30th, 2010. His Hirsch index h is 20.

[Only publications in peer-reviewed journals are considered].

Recent preprints and working papers are available from:

<http://ideas.repec.org/e/psc89.html>

http://arxiv.org/find/grp_physics/1/au:+Scalas_Enrico/0/1/0/all/0/1

2010:

[90] GERMANO G, POLITI M, SCALAS E., SCHILLING R.L (2010). Ito and Stratonovich integrals on compound renewal processes: the normal/Poisson case. COMMUNICATIONS IN NONLINEAR SCIENCE & NUMERICAL SIMULATION, vol. 15; p. 1583-1588, ISSN: 1007-5704, doi: 10.1016/j.cnsns.2009.06.010.

[89] POLITI M, SCALAS E., FULGER D, GERMANO G (2010). Spectral densities of Wishart-Levy free stable random matrices. THE EUROPEAN PHYSICAL JOURNAL. B, CONDENSED MATTER PHYSICS, vol. 73; p. 13-22, ISSN: 1434-6028, doi: 10.1140/epjb/e2009-00360-7.

2009:

[88] FERRARO S, MANZINI M, MASOERO A, SCALAS E. (2009). A random telegraph signal of Mittag-Leffler type. PHYSICA. A, vol. 388; p. 3991-3999, ISSN: 0378-4371, doi: 10.1016/j.physa.2009.06.036.

[87] SCALAS E., SCHWEITZER F (2009). Complex Networks. ADVANCES IN COMPLEX SYSTEM, vol. 12; p. 1-2, ISSN: 0219-5259, doi: 10.1142/S0219525909002118

[86] GERMANO G, POLITI M, SCALAS E., SCHILLING R.L (2009). Stochastic calculus for uncoupled continuous-time random walks. PHYSICAL REVIEW E, STATISTICAL, NONLINEAR, AND SOFT MATTER PHYSICS, vol. 79; p. 066102, ISSN: 1539-3755, doi: 10.1103/PhysRevE.79.066102.

[85] SAZUKA N., INOUE J., SCALAS E. (2009). The distribution of first-passage times and durations in FOREX and future markets. PHYSICA A-STATISTICAL MECHANICS AND ITS APPLICATIONS . In press. doi:10.1016/j.physa.2009.03.027.

2008:

[84] FULGER D., SCALAS E., GERMANO G. (2008). Monte Carlo simulation of uncoupled continuous-time random walks yielding a stochastic solution of the space-time fractional diffusion equation. PHYSICAL REVIEW E, STATISTICAL, NONLINEAR, AND SOFT MATTER PHYSICS. vol. 77, pp. 021122(1)-021122(7) ISSN: 1539-3755. doi:10.1103/PhysRevE.77.021122.

[83] POLITI M., SCALAS E. (2008). Fitting the empirical distribution of intertrade durations.

PHYSICA A-STATISTICAL MECHANICS AND ITS APPLICATIONS Volume: 387 Issue: 8-9 Pages: 2025-2034. ISSN: 0378-4371.

[82] MINICOZZI P., RAPALLO F., SCALAS E., DONDERO F. (2008). Accuracy and robustness of clustering algorithms for small-size applications in bioinformatics. PHYSICA A-STATISTICAL MECHANICS AND ITS APPLICATIONS Volume: 387 Issue: 25 Pages: 6310-6318 Published: NOV 1 2008. ISSN: 0378-4371.

[81] CORONEL-BRIZIO, H. F., HERNANDEZ-MONTOYA A.R., RAPALLO F., SCALAS E. (2008). Statistical auditing and randomness test of lotto k/N-type games. PHYSICA A-STATISTICAL MECHANICS AND ITS APPLICATIONS Volume: 387 Issue: 25 Pages: 6385-6390 Published: NOV 1 2008. ISSN: 0378-4371.

[80] LIM G., KIM S., SCALAS E., KIM K., CHANG K.H. (2008). Analysis of price fluctuations in futures exchange markets. PHYSICA A-STATISTICAL MECHANICS AND ITS APPLICATIONS Volume: 387 Issue: 12 Pages: 2823-2830 Published: MAY 1 2008. ISSN: 0378-4371.

[79] LIM G., KIM S., KIM K., LEE D.I., SCALAS E. (2008). Dynamical behaviors of inter-out-of-equilibrium state intervals in Korean futures exchange markets. PHYSICA A-STATISTICAL MECHANICS AND ITS APPLICATIONS Volume: 387 Issue: 12 Pages: 2831-2836 Published: MAY 1 2008. ISSN: 0378-4371.

2007:

[78] SCALAS E., MARTIN E, GERMANO G. (2007). Ehrenfest urn revisited: Playing the game on a realistic fluid model. PHYSICAL REVIEW E, STATISTICAL, NONLINEAR, AND SOFT MATTER PHYSICS. vol. 76, pp. 011104(1)-011104(6) ISSN: 1539-3755. doi:10.1103/PhysRevE.76.011104.

[77] SCALAS E. (2007). Mixtures of compound Poisson processes as models of tick-by-tick financial data. CHAOS, SOLITONS AND FRACTALS. vol. 34, pp. 33-40 ISSN: 0960-0779. doi:10.1016/j.chaos.2007.01.047.

[76] POLITI M., SCALAS E. (2007). Activity spectrum from waiting-time distribution. PHYSICA. A. vol. 383, pp. 43-48 ISSN: 0378-4371. doi:10.1016/j.physa.2007.04.086.

[75] MOSETTI G., JUG G., SCALAS E. (2007). Power laws from randomly sampled continuous-time random walks. PHYSICA. A. vol. 375, pp. 233-238 ISSN: 0378-4371. doi:10.1016/j.physa.2006.08.065.

[74] TOTH B., SCALAS E., HUBER J., KIRCHLER M. (2007). The value of information in a multi-agent market model - The luck of the uninformed. THE EUROPEAN PHYSICAL JOURNAL. B, CONDENSED MATTER PHYSICS. vol. 55, pp. 115-120 ISSN: 1434-6028. doi:10.1140/epjb/e2007-00046-2.

[73] SCALAS E., KIM K. (2007). The art of fitting financial time series with Levy stable distributions. JOURNAL OF THE KOREAN PHYSICAL SOCIETY. vol. 50, pp. 105-111 ISSN: 0374-4884.

[72] KIM K, YOON S.M, KIM S.Y, LEE D.I, SCALAS E. (2007). Dynamical mechanisms of the continuous-time random walk, multifractals, herd behaviors and minority games in financial markets. JOURNAL OF THE KOREAN PHYSICAL SOCIETY. vol. 50, pp. 182-190 ISSN: 0374-4884.

[71] KIM C.-H., PARK C. H., KIM S. Y., KIM K., SCALAS E. (2007). Dynamics of avalanche activities in financial markets. INTERNATIONAL JOURNAL OF MODERN PHYSICS C vol 18 pp. 119-127.

2006:

[70] MEERSCHAERT M.M, SCALAS E. (2006). Coupled continuous time random walks in finance. PHYSICA. A. vol. 370, pp. 114-118 ISSN: 0378-4371. doi:10.1016/j.physa.2006.04.034.

[69] SCALAS E., GALLEGATI M, GUERCI E, MAS D, TEDESCHI A. (2006). Growth and allocation of resources in economics: The agent-based approach. PHYSICA. A. vol. 370, pp. 86-90 ISSN: 0378-4371. doi:10.1016/j.physa.2006.04.038.

[68] SCALAS E., GARIBALDI U, DONADIO S. (2006). Statistical equilibrium in simple exchange games I - Methods of solution and application to the Bennati-Dragulescu-Yakovenko (BDY) game. THE EUROPEAN PHYSICAL JOURNAL. B, CONDENSED MATTER PHYSICS. vol. 53, pp. 267-272 ISSN: 1434-6028.

[67] SCALAS E, KAIZOJI T, KIRCHLER M, HUBER J, TEDESCHI A. (2006). Waiting times between orders and trades in double-auction markets PHYSICA A vol. 366, pp. 463-471 ISSN: 0378-4371. doi:10.1016/j.physa.2005.09.047

[66] GALLEGATI M, PALESTRINI A, DELLI GATTI D, SCALAS E. (2006). Aggregation of Heterogeneous Interacting Agents: The Variant Representative Agent Framework JOURNAL OF ECONOMIC COORDINATION AND INTERACTION vol. 1, pp. 5 – 19 ISSN: 1860-711X doi: 10.1007/s11403-006-0001-z

[65] SCALAS E. (2006). The application of continuous-time random walks in finance and economics. PHYSICA. A. vol. 362, pp. 225-239 ISSN: 0378-4371. doi:10.1016/j.physa.2005.11.024.

2005:

[64] SCALAS E, GORENFLO R, LUCKOCK H, MAINARDI F, MANTELLI M, RABERTO M. (2005). On the Intertrade Waiting-time Distribution FINANCE LETTERS, 3, 38-43 2005.

2004:

[63] ALESSANDRO B, ..., SCALAS E, (2004). Fission cross sections of lead projectiles in Pb-nucleus interactions at 40 and 158 GeV/c per nucleon. PHYSICAL REVIEW. C, NUCLEAR PHYSICS. vol. 69, pp. 034904 ISSN: 0556-2813. doi:10.1103/PhysRevC.69.034904.

[62] ARNALDI R, ..., SCALAS E, (2004). Charmonia suppression in nucleus-nucleus interactions at CERN SPS. ACTA PHYSICA HUNGARICA. HEAVY ION PHYSICS. vol.

19, pp. 337-341 ISSN: 1219-7580.

[61] ARNALDI R, ..., SCALAS E, (2004). Performances of a prototype for the ALICE Muon trigger at LHC. IEEE TRANSACTIONS ON NUCLEAR SCIENCE. vol. 51, pp. 375-382 ISSN: 0018-9499.

[60] ARNALDI R, ..., SCALAS E, (2004). Resistive plate chamber for thermal neutron detection. NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH. SECTION B, BEAM INTERACTIONS WITH MATERIALS AND ATOMS. vol. 213, pp. 284-288 ISSN: 0168-583X.

[59] DI MATTEO T, AIROLDI M, SCALAS E. (2004). On pricing of interest rate derivatives. PHYSICA. A. vol. 339, pp. 189-196 ISSN: 0378-4371. doi:10.1016/j.physa.2004.03.042.

[58] SCALAS E, GORENFLO R, LUCKOCK H, MAINARDI F, MANTELLI M, RABERTO M. (2004). Anomalous waiting times in high-frequency financial data. QUANTITATIVE FINANCE. vol. 4, pp. 695-702 ISSN: 1469-7688.

[57] SCALAS E, GORENFLO R, MAINARDI F. (2004). Uncoupled continuous-time random walks: Solution and limiting behavior of the master equation. PHYSICAL REVIEW E, STATISTICAL, NONLINEAR, AND SOFT MATTER PHYSICS. vol. 69, pp. 011107 ISSN: 1539-3755. doi:10.1103/PhysRevE.69.011107.

2003:

[56] ALESSANDRO B, ..., SCALAS E, (2003). phi production in Pb-Pb collisions at 158 GeV/c per nucleon incident momentum. PHYSICS LETTERS. SECTION B. vol. 555, pp. 147-154 ISSN: 0370-2693.

[55] ARNALDI R, ..., SCALAS E, (2003). Ageing tests on the low-resistivity RPC for the ALICE dimuon arm. NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH. SECTION A, ACCELERATORS, SPECTROMETERS, DETECTORS AND ASSOCIATED EQUIPMENT. vol. 508, pp. 106-109 ISSN: 0168-9002.

[54] SCALAS E, GORENFLO R, MAINARDI F, RABERTO M. (2003). Revisiting the derivation of the fractional diffusion equation. FRACTALS-COMPLEX GEOMETRY PATTERNS AND SCALING IN NATURE AND SOCIETY. vol. 11, pp. 281-289 ISSN: 0218-348X. Suppl. S.

2002:

[53] ABREU MC, ..., SCALAS E, ... (2002). Pseudorapidity distributions of charged particles as a function of centrality in Pb-Pb collisions at 158 and 40 GeV per nucleon incident energy. PHYSICS LETTERS. SECTION B. vol. 530, pp. 33-42 ISSN: 0370-2693.

[52] ABREU MC, ..., SCALAS E, ... (2002). Scaling of charged particle multiplicity in Pb-Pb collisions at SPS energies. PHYSICS LETTERS. SECTION B. vol. 530, pp. 43-55 ISSN: 0370-2693.

[51] ARNALDI R, ..., SCALAS E, (2002). Spatial resolution of RPC in streamer mode. NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH. SECTION A,

ACCELERATORS, SPECTROMETERS, DETECTORS AND ASSOCIATED EQUIPMENT. vol. 490, pp. 51-57 ISSN: 0168-9002.

[50] BORDALO P, ..., SCALAS E, (2002). Recent results on J/psi from experiment NA50. NUCLEAR PHYSICS. A. vol. 698, pp. 127C-134C ISSN: 0375-9474.

[49] RABERTO M, SCALAS E, MAINARDI F. (2002). Waiting-times and returns in high frequency financial data: an empirical study. PHYSICA. A. vol. 314, pp. 749-755 ISSN: 0378-4371. doi:10.1016/S0378-4371(02)01048-8.

[48] REVERBERI AP, SCALAS E, VEGLIO F. (2002). Numerical solution of moving boundary problems in diffusion processes with attractive and repulsive interactions. JOURNAL OF PHYSICS. A, MATHEMATICAL AND GENERAL. vol. 35, pp. 1575-1588 ISSN: 0305-4470.

2001:

[47] ABREU MC, ..., SCALAS E, (2001). The dependence of the anomalous J/psi suppression on the number of participant nucleons. PHYSICS LETTERS. SECTION B. vol. 521, pp. 195-203 ISSN: 0370-2693.

[46] ARNALDI R, ..., SCALAS E, (2001). A dual threshold technique to improve the time resolution of resistive plate chambers in streamer mode. NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH. SECTION A, ACCELERATORS, SPECTROMETERS, DETECTORS AND ASSOCIATED EQUIPMENT. vol. 457, pp. 117-125 ISSN: 0168-9002.

[45] ARNALDI R, ..., SCALAS E, (2001). Performances of zero degree calorimeters for the ALICE experiment. NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH. SECTION A, ACCELERATORS, SPECTROMETERS, DETECTORS AND ASSOCIATED EQUIPMENT. vol. 456, pp. 248-258 ISSN: 0168-9002.

[44] HAAS H, CAETANO W, BORISSEVITCH GP, TABAK M, SACHEZ MIM, OLIVEIRA ON, SCALAS E, GOLDMANN M. (2001). Interaction of dipyridamole with phospholipid monolayers at the air-water interface: Surface pressure and grazing incidence X-ray diffraction studies. CHEMICAL PHYSICS LETTERS. vol. 335, pp. 510-516 ISSN: 0009-2614.

2000:

[43] ARNALDI R, ..., SCALAS E, (2000). The ALICE dimuon trigger: overview and electronics prototypes. NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH. SECTION A, ACCELERATORS, SPECTROMETERS, DETECTORS AND ASSOCIATED EQUIPMENT. vol. 456, pp. 126-131 ISSN: 0168-9002.

[42] ARNALDI R, ..., SCALAS E, (2000). Study of the resistive plate chambers for the ALICE Dimuon Arm. NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH. SECTION A, ACCELERATORS, SPECTROMETERS, DETECTORS AND ASSOCIATED EQUIPMENT. vol. 456, pp. 73-76 ISSN: 0168-9002.

[41] ARNALDI R, ..., SCALAS E, (2000). Influence of temperature and humidity on

bakelite resistivity. NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH. SECTION A, ACCELERATORS, SPECTROMETERS, DETECTORS AND ASSOCIATED EQUIPMENT. vol. 456, pp. 140-142 ISSN: 0168-9002.

[40] ARNALDI R, ..., SCALAS E, (2000). A low-resistivity RPC for the ALICE dimuon arm. NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH. SECTION A, ACCELERATORS, SPECTROMETERS, DETECTORS AND ASSOCIATED EQUIPMENT. vol. 451, pp. 462-473 ISSN: 0168-9002.

[39] ARNALDI R, ..., SCALAS E, (2000). Performance of a forward neutron calorimeter for the ALICE experiment. IEEE TRANSACTIONS ON NUCLEAR SCIENCE. vol. 47, pp. 1503-1505 ISSN: 0018-9499.

[38] MAINARDI F, RABERTO M, GORENFLO R, SCALAS E. (2000). Fractional calculus and continuous-time finance II: the waiting-time distribution. PHYSICA. A. vol. 287, pp. 468-481 ISSN: 0378-4371.

[37] PELIZZOLA A, PRETTI M, SCALAS E. (2000). Heterochirality in Langmuir monolayers and antiferromagnetic Blume-Emery-Griffiths model. JOURNAL OF CHEMICAL PHYSICS. vol. 112, pp. 8126-8136 ISSN: 0021-9606.

[36] RIDI A, SCALAS E, GLIOZZI A. (2000). Noise measurements in bilayer lipid membranes during electroporation. EUROPEAN PHYSICAL JOURNAL E. vol. 2, pp. 161-168 ISSN: 1292-8941.

[35] SCALAS E, GORENFLO R, MAINARDI F. (2000). Fractional calculus and continuous-time finance. PHYSICA. A. vol. 284, pp. 376-384 ISSN: 0378-4371. doi:10.1016/S0378-4371(00)00255-7.

1999:

[34] ABREU MC, ..., SCALAS E, (1999). Fission of lead projectiles in Pb-nucleus collisions at the SPS. NUCLEAR PHYSICS. A. vol. 661, pp. 321C-324C ISSN: 0375-9474.

[33] ARNALDI R, ..., SCALAS E, (1999) The trigger of the ALICE dimuon arm: Architecture and detectors. NUCLEAR PHYSICS. A. vol. 661, pp. 712C-715C ISSN: 0375-9474.

[32] CUNIBERTI G, RABERTO M, SCALAS E. (1999). Correlations in the bond-future market. PHYSICA. A. vol. 269, pp. 90-97 ISSN: 0378-4371. doi:10.1016/S0378-4371(99)00083-7.

[31] INDIVERI G, SCALAS E, LEVI AC, GLIOZZI A. (1999). Morphologies in two dimensional growth with attractive long-range interactions. PHYSICA. A. vol. 273, pp. 217-230 ISSN: 0378-4371. doi:10.1016/S0378-4371(99)00231-9.

[30] RABERTO M, SCALAS E, CUNIBERTI G, RIANI M. (1999). Volatility in the Italian stock market: an empirical study. PHYSICA. A. vol. 269, pp. 148-155 ISSN: 0378-4371. doi:10.1016/S0378-4371(99)00089-8.

1998:

[29] DANANI A, FERRANDO R, SCALAS E, TORRI M. (1998). Collective surface diffusion on triangular and square interacting lattice gases. SURFACE SCIENCE. vol. 409, pp. 117-129 ISSN: 0039-6028.

[28] DANANI A, FERRANDO R, SCALAS E, TORRI M. (1998). Collective surface diffusion on a triangular lattice in presence of ordered phases. SURFACE SCIENCE. vol. 402, pp. 281-285 ISSN: 0039-6028.

[27] PETERSON IR, BREZESINSKI G, STRUTH B, SCALAS E. (1998). Grazing incidence X-ray diffraction study of octadecanoic acid monolayers. JOURNAL OF PHYSICAL CHEMISTRY. B, CONDENSED MATTER, MATERIALS, SURFACES, INTERFACES & BIOPHYSICAL. vol. 102, pp. 9437-9442 ISSN: 1520-6106.

[26] REVERBERI AP, SCALAS E. (1998). Dynamic scaling of a reaction-limited decay process. PHYSICA. A. vol. 254, pp. 348-357 ISSN: 0378-4371.

[25] RIDI A, SCALAS E, ROBELLO M, GLIOZZI A. (1998). Linear response of a fluctuating lipid bilayer. THIN SOLID FILMS. vol. 327, pp. 796-799 ISSN: 0040-6090.

[24] SCALAS E. (1998). Scaling in the market of futures. PHYSICA. A. vol. 253, pp. 394-402 ISSN: 0378-4371. doi:10.1016/S0378-4371(97)00652-3.

[23] SCALAS E, BREZESINSKI G, KAGANER VM, MOHWALD H. (1998). Effect of chiral interactions on the structure of Langmuir monolayers. PHYSICAL REVIEW E. vol. 58, pp. 2172-2178 ISSN: 1063-651X.

[22] SCALAS E, RIDI A, ROBELLO M, GLIOZZI A. (1998). Flicker noise in bilayer lipid membranes. EUROPHYSICS LETTERS. vol. 43, pp. 101-105 ISSN: 0295-5075.

1997:

[21] DANANI A, FERRANDO R, SCALAS E, TORRI M. (1997). Lattice-gas theory of collective diffusion in adsorbed layers. INTERNATIONAL JOURNAL OF MODERN PHYSICS B. vol. 11, pp. 2217-2279 ISSN: 0217-9792.

[20] REVERBERI AP, SCALAS E. (1997). Surface selective deconstruction: A Monte Carlo study. FRACTALS-COMPLEX GEOMETRY PATTERNS AND SCALING IN NATURE AND SOCIETY. vol. 5, pp. 327-332 ISSN: 0218-348X.
1996:

[19] DANANI A, FERRANDO R, SCALAS E, TORRI M. (1996). Multi-site correlation functions in two-dimensional lattice gases. PHYSICA. A. vol. 223, pp. 149-166 ISSN: 0378-4371. doi:10.1016/0378-4371(95)00288-X.

[18] INDIVERI G, LEVI AC, GLIOZZI A, SCALAS E, MÖHWALD H. (1996). Cluster growth with long-range interactions. THIN SOLID FILMS. vol. 285, pp. 106-109 ISSN: 0040-6090.

[17] SCALAS E, BREZESINSKI G, MÖHWALD H, KAGANER VM, BOUWMAN WG, KJAER K. (1996). Chirality effects on 2D phase transitions. THIN SOLID FILMS. vol. 285, pp. 56-61 ISSN: 0040-6090.

1995:

[16] BREZESINSKI G, SCALAS E, STRUTH B, MÖHWALD H, BRINGEZU F, GEHLERT U, WEIDEMANN G. (1995). RELATING LATTICE AND DOMAIN-STRUCTURES OF MONOGLYCERIDE MONOLAYERS. JOURNAL OF PHYSICAL CHEMISTRY. vol. 99, pp. 8758-8762 ISSN: 0022-3654.

[15] DANANI A, FERRANDO R, SCALAS E, TORRI M, BRIVIO GP. (1995). LATTICEGAS MODEL OF DIFFUSION OF NH₃ ON RE(0001). CHEMICAL PHYSICS LETTERS. vol. 236, pp. 533-537 ISSN: 0009-2614.

1994:

[14] FERRANDO R, SCALAS E, TORRI M. (1994). PROJECTION-OPERATOR ROUTE TO THE GENERALIZED DARKEN EQUATION. PHYSICS LETTERS A. vol. 186, pp. 415-418 ISSN: 0375-9601.

[13] GLIOZZI A, LEVI AC, MENESSINI M, SCALAS E. (1994). TEMPERATURE AND DISEQUILIBRIUM DEPENDENCE OF CLUSTER GROWTH. PHYSICA. A. vol. 203, pp. 347-358 ISSN: 0378-4371. doi:10.1016/0378-4371(94)90003-5.

[12] SCALAS E, FERRANDO R. (1994). PAIR-CORRELATION FUNCTION IN 2-DIMENSIONAL LATTICE GASES. PHYSICAL REVIEW E. vol. 49, pp. 513-520 ISSN: 1063-651X.

[11] STRUTH B, SCALAS E, BREZESINSKI G, MÖHWALD H, BRINGEZU F, BOUWMAN WG, KJAER K. (1994). INFLUENCE OF A HYDROPHILIC SPACER ON THE STRUCTURE OF A PHOSPHOLIPID MONOLAYER. NUOVO CIMENTO DELLA SOCIETÀ ITALIANA DI FISICA. D CONDENSED MATTER, ATOMIC, MOLECULAR AND CHEMICAL PHYSICS, BIOPHYSICS. vol. 16, pp. 1545-1550 ISSN: 0392-6737.

[10] TORRI M, FERRANDO R, SCALAS E, BRIVIO GP. (1994). COLLECTIVE DIFFUSION IN A LATTICE-GAS - APPLICATION TO O/W(110). SURFACE SCIENCE. vol. 318, pp. 443 ISSN: 0039-6028.

[9] TORRI M, FERRANDO R, SCALAS E, BRIVIO GP. (1994). COLLECTIVE DIFFUSION IN A LATTICE-GAS - APPLICATION TO O/W(110). SURFACE SCIENCE. vol. 307, pp. 565-569 ISSN: 0039-6028.

1993:

[8] FERRANDO R, SCALAS E. (1993). INCOHERENT-SCATTERING WIDTH IN 2D SYSTEMS WITH LATERAL INTERACTIONS. SURFACE SCIENCE. vol. 287, pp. 907-910 ISSN: 0039-6028.

[7] FERRANDO R, SCALAS E. (1993). SELF-DIFFUSION IN A 2D LATTICE GAS WITH LATERAL INTERACTIONS. SURFACE SCIENCE. vol. 281, pp. 178-190 ISSN: 0039-6028.

[6] FERRANDO R, SCALAS E, TORRI M. (1993). COLLECTIVE AND TRACER

DIFFUSION IN LOW-COVERAGE ADSORBATES. JOURNAL OF ELECTRON SPECTROSCOPY AND RELATED PHENOMENA. vol. 64-5, pp. 813-818 ISSN: 0368-2048.

[5] GENCO I, GLIOZZI A, RELINI A, ROBELLO M, SCALAS E. (1993). ELECTROPORATION IN SYMMETRICAL AND ASYMMETRIC MEMBRANES. BIOCHIMICA ET BIOPHYSICA ACTA. vol. 1149, pp. 10-18 ISSN: 0006-3002.

[4] SCALAS E, VIANO GA. (1993). THE HAUSDORFF MOMENTS IN STATISTICALMECHANICS. JOURNAL OF MATHEMATICAL PHYSICS. vol. 34, pp. 5781-5800 ISSN: 0022-2488.

[3] SCALAS E, VIANO GA. (1993). EPSILON-ENTROPY AND EPSILON-CAPACITY IN THE THEORY OF ILL-POSED PROBLEMS. INVERSE PROBLEMS. vol. 9, pp. 545-550 ISSN: 0266-5611.

[2] SCALAS E, VIANO GA. (1993). RESOLVING POWER AND INFORMATION THEORY IN SIGNAL RECOVERY. JOURNAL OF THE OPTICAL SOCIETY OF AMERICA. A, OPTICS AND IMAGE SCIENCE. vol. 10, pp. 991-996 ISSN: 0740-3232.

1990:

[1] SCALAS E, LEVI AC, GLIOZZI A. (1990). A COMPUTER STUDY OF A SIMPLE STATISTICAL-MECHANICAL MODEL OF PHOSPHOLIPID MONOLAYERS AND BILAYERS. JOURNAL DE PHYSIQUE. vol. 51, pp. C7333-C7338 ISSN: 0302-0738. Suppl. C7.

Books

He is currently writing the chapters on continuous-time random walks of a collective book on *Fractional Calculus Models and Numerical Methods* for World Scientific.

Together with Ubaldo Garibaldi, he has written a book on *Finitary Probabilistic Methods in Physics and Economics* for Cambridge University Press:

<http://www.cambridge.org/catalogue/catalogue.asp?isbn=9780521515597>

Selected chapters in collective books

Enrico Scalas is author or co-author of several chapters in edited books. Here are some examples:

ANGLE J., NIELSEN F., SCALAS E. (2010). The Kuznets Curve and the Inequality Process. In B. BASU, B.K. CHAKRABARTI, S.R. CHAKRAVARTY, K. GANGOPADHYAY (EDS.). *Econophysics and Economics of Games, Social Choices and Quantitative Techniques*. ISBN-10: 8847015006, ISBN-13: 978-8847015005. BERLIN: Springer (GERMANY).

SCALAS E. (2006). Five years of continuous time random walks in Econophysics. In A. NAMATAME, T. KAIZOJI, Y. ARUKA (EDS.) *The Complex Networks of Economic Interactions*. ISBN 3540287264. BERLIN: Springer (GERMANY).

SCALAS E, CINCOTTI S, DOSE C, RABERTO M. (2005). Fraudulent agents in artificial financial markets. In T. LUX, S. REITZ, E. SAMANIDOU (EDS.). Nonlinear Dynamics And Heterogenous Interacting Agents. ISBN: 3540222375. BERLIN: Springer (GERMANY).

MAINARDI F, GORENFLO R, SCALAS E. (2004). A renewal process of Mittag-Leffler type. In M.M. NOVAK (ED.). Thinking in Pattern. (pp. 35-46). ISBN: 9812388222. SINGAPORE: World Scientific (SINGAPORE).

GORENFLO R, MAINARDI F, SCALAS E, RABERTO M. (2001). Fractional Calculus and Continuous-Time Finance III: the Diffusion Limit. In M KOHLMANN, S TANG. (EDS). Mathematical Finance. (pp. 171-180). ISBN: 3764365536. BASEL: Birkhäuser (SWITZERLAND).

References

I am including a list of people who are acquainted with my recent work and may be contacted if necessary for further information. Other names of possible contacts (including students) are given in my CV.

Prof. Dr. Guido Germano, AG Computersimulation, Fachbereich Chemie
Philipps-Universität Marburg, Hans-Meerwein-Straße 6, D-35043 Marburg, Germany;
guido.germano@staff.uni-marburg.de

Prof. Dr. Em. Rudolf Gorenflo, Fachbereich Mathematik und Informatik,
Freie Universität Berlin, Arnimallee 3, D-14195 Berlin, Germany;
gorenflo@mi.fu-berlin.de

Prof. Francesco Mainardi, Dipartimento di Fisica, Università degli Studi di Bologna, via
Irnerio 46, I-40126 Bologna, Italy; mainardi@bo.infn.it

Prof. Dr. René L. Schilling, Professor für Wahrscheinlichkeitstheorie, Institut für
Mathematische Stochastik, Technische Universität Dresden, Zellescher Weg 12-14
D-01069 Dresden, Germany; rene.schilling@tu-dresden.de

References from my University

Prof. Pierluigi Ferrari, Chair of Mathematics, Dipartimento di Scienze e Tecnologie
Avanzate, Università degli Studi del Piemonte Orientale, via T. Michel 11, 15100
Alessandria, Italy; pferrari@unipmn.it