

## ALESSANDRO SARRACINO - CURRICULUM VITAE

### Personal data

Alessandro Sarracino, born in Naples, Italy, December 22, 1981.

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### Academic and scientific career

**Since December 2013:** Research fellowship in the group of O. Bénichou at the LPTMC, Université Pierre et Marie Curie, Jussieu, Paris.

**December 2009-November 2013:** Research fellowship (from the GRANULARCHAOS project funded by MIUR) in the group of A. Puglisi and A. Vulpiani at the CNR-ISC and Department of Physics, University “Sapienza”, Roma, Italy.

**February 2009-November 2009:** Research fellowship (from PRIN) at the Department of Mathematics and Informatics, University of Salerno, Italy.

**January 2009:** Ph.D. in Physics from the University of Salerno, Italy, with a Thesis on “Nonlinear fluctuation-dissipation relations: analytical derivation and numerical applications”.  
Thesis Advisor Professor Marco Zannetti.

**October 2005:** Laurea Degree in Physics from the University Federico II of Naples, Italy, with a Thesis on “Segregation and dynamic instabilities in granular mixtures”, with the mark 110/110 *cum laude*.  
Thesis Advisor Professor Antonio Coniglio.

## Fields of research

**Non-equilibrium statistical mechanics:** breakdown of time-reversibility and detailed balance in Markov processes; entropy production and fluctuation relations; generalized fluctuation-dissipation relations; applications to Ising systems, spin glasses and granular gases.

**Granular systems:** dynamics of a tracer particle in a granular bath; non-equilibrium fluctuating hydrodynamics: theoretical, numerical and experimental study of structure factors in driven granular fluids.

**Fluctuation-dissipation relations:** field-free algorithms for the measurement of the response function; second order fluctuation-dissipation relations and nonlinear susceptibilities; applications to coarsening systems and spin glasses; growing length-scales in disordered systems.

**Brownian motors:** ratchet effect driven by nonlinear friction; granular Brownian ratchets; ratchet effect in an aging glass.

**Anomalous dynamics:** diffusion and response function in inhomogeneous systems; continuous time random walks and Lévy collision process; Einstein relation and anomalous transport.

## Publications

*Nonequilibrium fluctuation-dissipation theorem and heat production*

E. Lippiello, M. Baiesi and A. Sarracino  
Phys. Rev. Lett. **112**, 140602 (2014)

*Nonequilibrium Brownian motion beyond the effective temperature*

A. Gnoli, A. Puglisi, A. Sarracino, A. Vulpiani  
PLoS ONE **9**, e93720 (2014)

*Fluctuations in partitioning systems with few degrees of freedom*

L. Cerino, G. Gradenigo, A. Sarracino, D. Villamaina, A. Vulpiani  
Phys. Rev. E **89**, 042105 (2014)

*Time asymmetry of the Kramers equation with nonlinear friction: fluctuation-dissipation relation and ratchet effect*

A. Sarracino  
Phys. Rev. E **88**, 052124 (2013)

*Rare events and scaling properties in field-induced anomalous dynamics*

R. Burioni, G. Gradenigo, A. Sarracino, A. Vezzani, A. Vulpiani  
J. Stat. Mech. (2013) P09022

- Fluctuation relations without uniform large deviations*  
G. Gradenigo, A. Sarracino, A. Puglisi and H. Touchette  
J. Phys. A: Math. Theor. **46**, 335002 (2013)
- Einstein relation in systems with anomalous diffusion*  
G. Gradenigo, A. Sarracino, D. Villamaina, and A. Vulpiani  
Acta Physica Polonica B **44**, 899 (2013)
- Non-equilibrium fluctuations in frictional granular motor: experiments and kinetic theory*  
A. Gnoli, A. Sarracino, A. Petri, and A. Puglisi  
Phys. Rev. E **89**, 052209 (2013)
- Ratchet effect driven by Coulomb friction: the asymmetric Rayleigh piston*  
A. Sarracino, A. Gnoli, and A. Puglisi  
Phys. Rev. E **87**, 040101(R) (2013)
- Brownian ratchet in a thermal bath driven by Coulomb friction*  
A. Gnoli, A. Petri, F. Dalton, G. Gradenigo, G. Pontuale, A. Sarracino, and A. Puglisi  
Phys. Rev. Lett. **110**, 120601 (2013)
- Entropy production in non-equilibrium fluctuating hydrodynamics*  
G. Gradenigo, A. Sarracino, and A. Puglisi  
J. Chem. Phys. **137**, 014509 (2012)
- The out of equilibrium response function in sub-diffusive systems*  
G. Gradenigo, A. Puglisi, A. Sarracino, A. Vulpiani and D. Villamaina  
Physica Scripta **86**, 058516 (2012)
- Einstein relation in superdiffusive systems*  
G. Gradenigo, A. Sarracino, D. Villamaina, and A. Vulpiani  
J. Stat. Mech. L06001 (2012)
- Non-equilibrium fluctuations in a driven stochastic Lorenz gas*  
G. Gradenigo, U. Marini Bettolo Marconi, A. Puglisi, and A. Sarracino  
Phys. Rev. E **85**, 031112 (2012)
- Dynamics of a massive intruder in a homogeneously driven granular fluid*  
A. Puglisi, A. Sarracino, G. Gradenigo, and D. Villamaina  
Granular Matter **14**, 235 (2012)
- Structure factors in granular experiments with homogeneous fluidization*  
A. Puglisi, A. Gnoli, G. Gradenigo, A. Sarracino, and D. Villamaina  
J. Chem. Phys. **136**, 014704 (2012)
- Non-equilibrium length in granular fluids: From experiment to fluctuating hydrodynamics*  
G. Gradenigo, A. Sarracino, D. Villamaina, and A. Puglisi  
Europhysics Letters **96**, 14004 (2011)

- Fluctuating hydrodynamics and correlation lengths in a driven granular fluid*  
G. Gradenigo, A. Sarracino, D. Villamaina, and A. Puglisi  
J. Stat. Mech. P08017 (2011)
- Estimate of temperature and its uncertainty in small systems*  
M. Falcioni, D. Villamaina, A. Vulpiani, A. Puglisi, and A. Sarracino  
Am. J. Phys. **79**, 777 (2011)
- On anomalous diffusion and the out of equilibrium response function in one-dimensional models*  
D. Villamaina, A. Sarracino, G. Gradenigo, A. Puglisi, and A. Vulpiani  
J. Stat. Mech. L01002 (2011)
- The ratchet effect in an ageing glass*  
G. Gradenigo, A. Sarracino, D. Villamaina, T. S. Grigera and A. Puglisi  
J. Stat. Mech. L12002 (2010)
- Irreversible dynamics of a massive intruder in dense granular fluids*  
A. Sarracino, D. Villamaina, G. Gradenigo and A. Puglisi  
Europhysics Letters **92**, 34001 (2010)
- Identification of the critical temperature from non-equilibrium time-dependent quantities*  
E. Lippiello and A. Sarracino  
Europhysics Letters **90**, 60001 (2010)
- Granular Brownian motion*  
A. Sarracino, D. Villamaina, G. Costantini, and A. Puglisi  
J. Stat. Mech. P04012 (2010)
- Fluctuations of two-time quantities and non-linear response functions*  
F. Corberi, E. Lippiello, A. Sarracino, and M. Zannetti  
J. Stat. Mech. P04003 (2010)
- Fluctuation-dissipation relations and field-free algorithms for the computation of response functions*  
F. Corberi, E. Lippiello, A. Sarracino, and M. Zannetti  
Phys. Rev. E **81**, 011124 (2010)
- Nonlinear response and fluctuation dissipation relations*  
E. Lippiello, F. Corberi, A. Sarracino, and Marco Zannetti  
Phys. Rev. E **78**, 041120 (2008)
- Nonlinear susceptibilities and the measurement of a cooperative length*  
E. Lippiello, F. Corberi, A. Sarracino, and M. Zannetti  
Phys. Rev. B **77**, 212201 (2008)

**Under review**

*Coulomb friction driving Brownian motors*

A. Manacorda, A. Puglisi, A. Sarracino

*A model for friction microscopy without external force*

A. Sarracino, A. Gnoli, A. Puglisi

## **Book chapter**

*Out-of-equilibrium generalized fluctuation-dissipation relations*

G. Gradenigo, A. Puglisi, A. Sarracino, D. Villamaina, and A. Vulpiani  
in “Nonequilibrium Statistical Physics of Small Systems: Fluctuation Relations and Beyond” (Wiley-VCH, Weinheim, 2013) R. Klages, W. Just, C. Jarzynski (Eds.)

*Large deviations of Brownian motors*

A. Sarracino and D. Villamaina  
to appear in “Large deviations in physics” Series: Lecture Notes in Physics (Springer, 2014) F. Cecconi, M. Cencini, A. Puglisi, D. Vergni and A. Vulpiani (Eds.)

## **Proceedings**

*Species segregation and dynamical instability of horizontally vibrated granular mixtures*

M. Pica Ciamarra, A. Sarracino, M. Nicodemi, and A. Coniglio  
In Traffic and Granular Flow 2005, A. Schadschneider, T. Poschel, T.; Khne, R.; Schreckenberg, M.; Wolf, D.E. (Eds.) (2007)

## **Referee activity**

New Journal of Physics

Europhysics Letters

Journal of Statistical Mechanics: Theory and Experiment

Journal of Physics A: Mathematical and Theoretical

Physica A

## Teaching Experience

**2012-2013:** Co-supervision of two master thesis at University of Rome Sapienza.

**February 2009-July 2009:** Assistance in the course of “Physics” for the 1st year graduating students, in the Department Mathematics and Informatics of the University of Salerno.

**Spring 2008:** Integrative lessons of Physics held in the University of Salerno for the 1st year graduating students.

## Organization of International Workshop

June 2012: “Non-equilibrium fluctuation-response relations”, Isola del Giglio (Gr), Italy

## Participation in Workshops and Schools

November 2013: Poster at “Conference on Friction and Energy Dissipation in Man-made and Biological Systems”, The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy.

September 2013: Poster at “Large deviations and rare events in physics and biology”, University of Rome Sapienza, Italy.

July 2013: Talk (invited) at 7th IDMRCS, Barcelona, Spain.

July 2013: Talk at “Small system nonequilibrium fluctuations, dynamics and stochasticity, and anomalous behavior”, KITPC, Beijing, China.

April 2013: Seminar at Dipartimento di Fisica, University of Padua, Italy.

March 2013: Poster (Best poster session award) at “38th Conference of the Middle European Cooperation in Statistical Physics”, Trieste, Italy.

March 2013: Seminar at LPTMC, Université Pierre et Marie Curie Paris VI, France.

November 2012: “Grandes déviations et systèmes de particules en interaction, états stationnaires hors équilibre”, IHP Paris, France.

June 2012: Talk (invited) at “XVII Convegno Nazionale di Fisica Statistica e dei Sistemi Complessi”, Parma, Italy.

June 2012: “Non-equilibrium fluctuation-response relations”, Isola del Giglio (Gr), Italy.

June 2012: “Frontiers in Statistical Physics and Complex Systems”, Catania, Italy.

January 2012: Seminar at LPTHE, Université Pierre et Marie Curie Paris VI, France.

January 2012: Talk at “Journées de Physique Statistique”, Paris, France.

October 2011: “Foundations and Applications of Non-Equilibrium Statistical Mechanics”, Stockholm, Sweden.

September 2011: Talk at the “ZCAM conference on Granular and Active Fluids”, Zaragoza, Spain.

March 2011: Poster at “Workshop on Dynamics in Viscous Liquids III”, Roma, Italy.

September 2010: Poster at “Anomalous Transport: from Billiards to Nanosystems”, Sperlonga, Italy.

July 2010: Talk at the “XXIV IUPAP International Conference on Statistical Physics”, Cairns, Australia.

June 2010: Talk (invited) at the “XV Convegno di Fisica Statistica”, Parma, Italy.

September 2009: Poster at the International Summer School “Fundamental Problems in Statistical Physics XII”, Leuven, Belgium.

May 2009: Seminar at ISC-CNR, University Sapienza Roma, Italy

August -September 2007: “Les Houches Predoctoral School in Statistical Physics”

September 2006: “IV Workshop on non equilibrium phenomena in supercooled fluids, glasses and amorphous materials”, Pisa, Italy.

## **Skills and Qualifications**

Known languages: Italian, English, French

Programming ability in C, Mathematica, LaTeX, FORTRAN