# Dr. Gerardo Aquino

*Curriculum Vitae*

## PERSONAL DETAILS


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| *Address* | Biochemistry Bdg., r. 301, Imperial College, SW7 2AZ London, UK |
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## EDUCATION

**PhD Theoretical Physics** Aug 2004

*University of North Texas (USA) GPA:4.00 (with highest grade)*

Supervisor: Prof. Paolo Grigolini

Thesis: *Non-Poissonian Statistics, Aging and Blinking Quantum Dots.*

**Laurea in Fisica** July 2000

*University of Pisa, Italy*

Thesis: *Entropy and Poincaré recurrences in the case of intermittent chaos.*

## RESEARCH EXPERIENCE

**Research associate** 2009-present

*Department of Life Sciences and Centre for Systems Biology & Bioinformatics, Imperial College, London, UK*

Receptors dynamics and cell sensing. Memory and Bayesian inference in cell sensing in fluctuating environments.

Supervisor: Dr. Robert G. Endres.

**Guest scientist** 2006-2008

*Max Planck Inst. for the Physics of Complex Systems, Dresden, Germany*

Linear response theory for non-ergodic renewal processes.

Negative feedback in cell signal transduction modules.

**Postdoctoral researcher** 2004-2006

*Institute for Theroretical Physics, University of Amsterdam.*

European Network DYGLAGEMEM:"Dynamics and statics of glasses and spin glasses: aging and memory"; scientific coordinator: Giorgio Parisi

supervisor: Prof. Theo M. Nieuwenhuizen

## SUMMARY OF RESEARCH INTERESTS

- Non-equilibrium statistical mechanics in complex physical and biological systems.
- Theory of stochastic processes and applications to physics and biology.
- Information theory, Bayesian inference and physical limits in cell sensing.
- Nonlinear dynamics, chaotic systems and fractional calculus.
- Theory of glassy systems.

## TEACHING EXPERIENCE

Mathematics tutorial for MRes Students in Systems Biology. 2012-pres.
Co-supervision of MRes student Gabriele Micali, thesis: *Amplitude and frequency modulation in models of nuclear transcription factor localization.*

Matlab computer practical in final year undergraduate module 2010-2012
of Integrated Systems Biology at Imperial College London.

Tutorials for the course of Statistical Physics at the Institute for 2004-2006
Theoretical Physics of the University of Amsterdam (ITFA).

Teaching assistant at the University of North Texas for laboratory courses 2003-2004
of Physics and Astronomy with responsibility of presentation materials and laboratory experiments.

Teaching assistant for the courses of General Physics I and II 2000-2001
at the Physics Department of the University of North Texas.

## GRANTS AND FELLOWSHIPS

- Leverhulme Trust grant, £130k: *Learning and kinetic proofreading for chemical sensing beyond the physical limit*, PI Dr. Robert G. Endres (1/2012-12/2014).
- BBSRC grant BB/G000131/1, £340k: *Engineering principles of chemotaxis signalling pathways*.PI Dr. Robert G. Endres (1/2009-12/2011) .

## INVITED TALKS

- Internal Seminar, King's College, Disordered Systems Group, London, April 24th, 2014.
- Biomaths Seminar, Mathematics Dept., Imperial College London, March 5th 2013.
- School of Engineering & Applied Science, Aston University, Birmingham, May 10th 2012.
- Institute of Mathematical Sciences, Imperial College London, February 1st 2011.
- Biomaths Seminar, Mathematics Dept., Imperial College London, February 1st 2010.
- University of Texas at Austin, Center for Learning and Memory, October 28th 2008.
- Condensed Matter Group Seminar, University of Meinz, October 23rd 2008.
- Biochemistry Department, Imperial College London, October 13th 2008.
- Dept. for Innovative Methods of Computing, Technical University, Dresden, June 2008.
- Oxford Complex Systems Group, May 24th 2008.
- Physics Colloquium, University of North Texas, May 1st, 2007.
- Physics Dept., University of Oldenburg, Germany, September 2006.
- Institute for Theoretical Physics, University of Amsterdam, April 2005.
- Institute for Theoretical Physics, University of Amsterdam, July 2004.

## LIST OF PUBLICATIONS

***indicates corresponding author, **indicates joint first author**

- **G. Aquino**,N. Wingreen, R. G. Endres
  *Know the single-receptor sensing limit? Think again.* (submitted to Nature Physics).

- G. Micali, **G. Aquino**, D. Richards, R. G. Endres
  *Accuracy of encoding and decoding by single cells: amplitude versus frequency modulation* (accepted for publication on PLoS Comput. Biol.).

- **G. Aquino**, L. Tweedy. D. Heindrich, R.G. Endres
  *Memory improves precision of cell sensing in fluctuating environments.*
  Sci. Rep. **4**, 588 (2014).

- M. Bologna, **G. Aquino***
  *Weakly driven diffusion in nonergodic regime: an analytical solution.*
  Eur. Phys. J. B **87**, 15 (2014).

- **G. Aquino****, S. Pageon, K. Lagrue, K. Köhler, R. G. Endres, D. Davis
  *Dynamics of Natural Killer cell receptor by quantitative analysis of photoswitchable protein.*
  Biophys. J. **105**, 1-10 (2013).

- **G. Aquino***, M. Bologna, P. Grigolini, B. J. West
  *Transmission of information between complex systems: 1/f resonance.*
  Phys. Rev. E **83**, 051130 (2011).

- **G. Aquino***, D. Clausnitzer, S. Tollis and R.G. Endres
  *Optimal receptor-cluster size determined by intrinsic and extrinsic noise.*
  Phys. Rev. E **83**, 021914 (2011).

- **G. Aquino*** and R.G. Endres
  *Increased accuracy of ligand sensing by receptor diffusion on cell surface.*
  Phys. Rev. E **82**, 041902 (2010).

- **G. Aquino*** and R. G. Endres
  *Increased accuracy of ligand sensing by receptor internalization*
  Phys. Rev. E **81**, 021909 (2010).

- **G. Aquino***, M. Bologna, P. Grigolini, B. J. West
  *Beyond the death of linear response theory:1/f optimal information transport.*
  Phys. Rev. Lett. **105**, 040601 (2010) [**32 citations**].
  **selected for 'physics.aps.org: spotlighting exceptional research'**

- **G. Aquino**, M. Bologna and H. Calisto
  *An exact analytical solution for generalized growth models driven by dichotomic noise.*
  Europhys. Lett. **89**, 50012 (2010).

- P. Grigolini, **G. Aquino**, M. Bologna, M. Lukovic and B. J. West
  *A theory of 1/f-noise in human cognition.*
  Physica A:Statistical Mechanics and its Applications **388**, 4192-4204 (2009) [**41 citations**].

- **G. Aquino*** and F. Giraldi
  *Entanglement entropy and determination of an unknown quantum state.*
  Phys. Rev. A, **78**, 062115 (2008).

- **G. Aquino***, A. Allahverdyan, Th. M. Nieuwenhuizen
*Memory effects in the standard model for glasses.*
Phys. Rev. Lett. **101**, 015901, (2008) arXiv:0710.2650.

- **G. Aquino***, P. Grigolini, B. J. West
*Linear Response and Fluctuation Dissipation Theorem in non-Poissonian Renewal Processes.*
Europhys. Lett. **80** , 10002 (2007) [**30 citations**].

- **G. Aquino***, L. Leuzzi, Th. M. Nieuwenhuizen
*Kovacs effect in a fragile glass model.*
Phys. Rev. B **73**, 094205 (2006).

- **G. Aquino***, L. Palatella, P. Grigolini
*Absorption and Emission in the non-Poissonian case: The theoretical challenge posed by renewal aging.*
Braz. J. of Phys. **2b**, p. 418-424 (2005).

- P. Allegrini, **G. Aquino***, P. Grigolini, L. Palatella, A. Rosa, B. J. West:
*Correlation functions and Generalized Master Equation of arbitrary age.*
Phys. Rev. E **71**, 066109 (2005) [**47 citations**].

- **G. Aquino***, L. Palatella , P. Grigolini:
*Absorption and emission in the non-Poissonian case.*
Phys. Rev. Lett. **93**, 050601 (2004) [**30 citations**] (**selected for the Virtual J. of Biol. Phys. Research** 8, 3 (2004)).

- **G. Aquino***, M. Bologna, P. Grigolini, B. J. West:
*Aging and rejuvination with fractional derivatives.*
Phys. Rev. E **70**, 036105 (2004) [**34 citations**].

- P. Allegrini, **G. Aquino***, P. Grigolini, L. Palatella, A. Rosa:
*Generalized master equation via aging continuous-time random walks.*
Phys. Rev. E **68**, 056123 (2003) [**63 citations**].

- **G. Aquino***, N.Scafetta, P.Grigolini:
*Sporadic randomness, Maxwell's demon and the Poincare' recurrence times.*
Chaos, Solitons and Fractals **12**, 2023 (2001).

### Proceedings

- **G. Aquino** and B. Mehmani
*Simultaneous measurement of non-commuting observables.*, Proceedings of the workshop "*Beyond the Quantum*" T. M. Nieuwenhuizen, V. Spicka eds., World Scientific, Singapore, 2007, pp. 115-124.

- **G. Aquino***, L. Leuzzi, Th. M. Nieuwenhuizen
*Kovacs effect in solvable model glasses.*
Luxembourg 14-25 Sep 2005, J. Phys.: Conf. Ser. **40**, 50-58 (2006).

- P. Allegrini, **G. Aquino**, M. Bologna, P. Grigolini, M. Ignaccolo, M. Pala, L. Palatella,A. Rosa, B. J. West:
*Decoherence, wave function collapses, non-ordinary statistical mechanics and the second principle.* AIP Conf. Proceedings **643** pp. 72-76. November 20, 2002.

## MISCELLANEOUS

- Member of IOP (Institute of Physics) and BPS (Biophysical Society).
- Reviewer for Physical Biology, Physical Review Letters, Physical Review A, E and X, Physics Letters A, European Physical Journal B, Chaos, Solitons & Fractals, Frontiers Neuroscience.
- Organizer of the Journal Club at the Centre for Integrative Systems Biology and Bioinformatics, Imperial College London.
- Attendance of development courses on Research Proposal Writing, Effective Networking, Time Management and Managing Your First Research Group.

## LANGUAGES

- Italian (native language), English (excellent), German and Spanish (intermediate level)

## REFERENCES


Dr. **Robert G. Endres**
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