

# CURRICULUM VITAE

**ELENA AGLIARI**

## GENERAL INFORMATION

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Date and Place of Birth	05 JULY 1980, PARMA (ITALY)
Citizenship	Italian
E-mail	<a href="mailto:agliari@mat.uniroma1.it">agliari@mat.uniroma1.it</a> ; <a href="mailto:elena.agliari@uniroma1.it">elena.agliari@uniroma1.it</a>
Certified E-mail	<a href="mailto:elena.agliari@pec.it">elena.agliari@pec.it</a>
Current position	Research Fellow (RTD-A) Department of Mathematics, Sapienza University, Rome, Italy
Web-Page	<a href="http://www.mat.uniroma1.it/people/agliari">http://www.mat.uniroma1.it/people/agliari</a>
Spoken Languages	Italian (native), English (fluent), French (basic), German (basic)
Orcid-ID	0000-0002-5121-3511

## EDUCATION AND QUALIFICATION

- July 2018: **National Scientific Qualification in Theoretical Physics of Fundamental Interactions (02/A2)** as Associate Professor (unanimous decision of the Committee)
- December 2016: **Qualification as Researcher** (ricercatore III livello a tempo indeterminato) in **Applied Mathematics** at CNR (Centro Nazionale delle Ricerche), prot. 368.15
- December 2013: **National Scientific Qualification in Mathematical Physics (01/A4)** as Associate Professor (unanimous decision of the Committee)
- December 2013: **National Scientific Qualification in Theoretical Physics of Matter (02/B2)** as Associate Professor (unanimous decision of the Committee)
- March 2007: **Ph.D. diploma in Physics** at Department of Physics, University of Parma
- March 2004: **Master Degree in Physics** at Department of Physics, University of Parma (final grade: 110/110 lode)
- July 1999: **High School Diploma** at Liceo Scientifico Statale "G. Ulivi" in Parma (final grade 100/100 lode)

## ACCADEMIC APPOINTMENTS

- June 2015 - present: **Research Fellow** (RTD-A, **SSD MAT/07**) at Mathematics Department, **Sapienza University**, Rome, Italy (3 year contract extended 2 more years)
- March 2015 - May 2015: **Assistant Professor** at Engineering Department, **University Campus Bio-Medico**, Rome, Italy
- November 2014: **Research guest** at Mathematics Department, **University of São Paulo** (Brazil)
- March 2014 - September 2014: **Research fellowship** at Physics Department, **Sapienza University of Rome** (Italy)
- December 2010 - November 2013: **Researcher Associate** and **local Coordinator** for the project "Dynamics and statistical mechanics of lymphocyte networks below the percolation threshold", within the MIUR program **FIRB** (Futuro In Ricerca) prot. RBF08EKEV [National Coordinator A. Barra (Sapienza University of Rome)], at Physics Department, University of **Parma** (Italy)
- 2010-2011: several periods spent as **Research Guest** at Laboratoire de Physique Théorique de la Matière Condensée, Université Pierre et Marie Curie, **Paris** (France) for collaboration with the research group led by O. Bénichou
- 2009-2013: several periods spent as **Researcher Guest** at **Sapienza University of Rome** (Italy) for collaboration with the research group "Complex Statistical Mechanics" led by F. Guerra
- 2009-2011: several periods spent as **Researcher Guest** at Albert-Ludwigs-Universität, **Freiburg** (Germany) for collaboration with the research group "Theoretical Polymer Physics" led by A. Blumen
- December 2008 – November 2010: **Post-doc** position (**Assegno di Ricerca**) for researches on "*Transport and Diffusion on complex structures*", at Physics Department, University of **Parma** (Italy)
- February 2008 – November 2008: **Post-doc** fellowship from "**Fondazione Angelo della Riccia**" for investigations on "*Coherent and incoherent dynamics on discrete structures*", at Albert-Ludwigs-Universität, **Freiburg** (Germany)

- January 2007 – January 2008: **Post-Doc** position (Borsa di Studio) for researches on “*Transport models for spin systems on complex topologies*”, at Physics Department, University of **Parma** (Italy)

### **MAIN RESEARCH TOPICS**

- Mathematical methods for neural networks and artificial intelligence  
Rigorous investigations on the Hopfield network (i.e., the standard model for associative retrieval) and on the Boltzmann machine (i.e., the standard model for learning) via statistical-mechanics techniques (e.g., smooth cavity field, multiple stochastic stability, random overlap structures, non-linear PDE approaches, interpolating replica trick, replica symmetry breaking). Development of a fluctuation theory for the order parameters to control analytically phase transitions. Extensions to more sophisticated embeddings (non-mean-field topologies and multi-species models) toward a rationale for deep learning.
- Statistical mechanics of complex systems and their applications  
Rigorous investigations on the role of disorder and of topology in the emerging properties of statistical-mechanics models (e.g., spin models, biochemical networks, social systems). To this task the development of mathematical models and methods is required, possibly combining standard techniques of statistical mechanics with tools stemming from different fields such as cybernetics (e.g., transfer functions theory, Laplace transforms, Fourier analysis) and graph theory (e.g., percolation and rewiring processes, centrality and clustering measures).
- Random walks (classical and quantum) in inhomogeneous topologies  
Rigorous solution of first-passage problems in low-dimension and/or non-exactly-decimable structures, possibly accounting for memory effects and splitting between local and average phenomena. Extension of the mean-field techniques for the treatment of processes defined in restricted geometries where the mixing hypothesis does not hold. These results were used in two main areas: "search strategies" and "reaction diffusion".  
Quantum algorithms for searching problems.

### **TEACHING ACTIVITY**

- A.Y. 2019/20, “**Models for Neural Networks**” at University Sapienza of Rome (Italy) - **Lecturer** [scheduled]
- July 2019, “**Machine Learning**” for researchers and PhD students within the “Unbound Prometheus” program held at Chania (Greece) - **Invited Lecturer** [scheduled]
- A.Y. 2017/18, “**Mathematics for Artificial Intelligence**” Reading course for the PhD programme in Mathematics at University Sapienza of Rome (Italy) - **Lecturer**
- A.Y. 2016/17, 2017/18, 2018/19, “**Mathematical Methods and Models for the Environment**” at University Sapienza of Rome (Italy) - **Lecturer**
- A.Y. 2015/16, “**Mathematical and Numerical Methods in Biology**” at University Sapienza of Rome (Italy) - **Lecturer**
- A.Y. 2014/15, “**Mechanics and Thermodynamics**” at University Campus Bio-Medico of Rome (Italy) - **Co-Lecturer**
- January 2015, “**Random Walks, diffusion and statistical mechanics**” at CIRM school for the Institut Henri Poincaré trimester on “Disordered Systems, Random Spatial Processes and their Applications”, Marseille (France) - **Invited Lecturer**
- December 2014, “**Modelling the complexity of the adaptive immune response**” for researchers and PhD students at Institut d’Études Avancées IMERA, Marseille (France) - **Invited Lecturer**
- A.Y. 2012/13, “**Physics of Complex Systems**”, University of Parma (Italy) - **Lecturer**
- A.Y. 2010/11, “**Mathematical Methods for Arts II**”, Politecnico “Scientia et Ars” (Italy) - **Lecturer**
- A.Y. 2010/11, “**Dynamical Systems**”, University of Parma (Italy) - **Teaching Assistant**
- A.Y. 2007/08, 2008/09, 2009/10, “**Physics I**”, Telematic University “San Raffaele” (Italy) - **Lecturer**
- A.Y. 2006/07: “**Complements of Quantum Physics**”, University of Parma (Italy) - **Teaching Assistant**
- A.Y. 2005/06, 2006/07: “**Statistical Physics I**”, University of Parma (Italy) - **Teaching Assistant**
- A.Y. 2004/05, 2006/07: “**Calculus III**”, University of Parma (Italy) - **Teaching Assistant**

### **SUPERVISION OF STUDENTS**

Since 2009 I have (co)-supervised  
 5 students for the Bachelor Thesis  
 15 students for the Master Thesis  
 5 PhD students  
 3 students for Stage

#### GRANTS AS PRINCIPAL INVESTIGATOR

- 2018 - "Progetto Giovani" 2018 from GNFM (Gruppo Nazionale di Fisica Matematica) to lead investigations on "**Approcci rigorosi al Deep Learning**" - 1.5 k€
- 2016 - "Progetto Giovani" 2016 from GNFM (Gruppo Nazionale di Fisica Matematica) to lead investigations on "**Statistical Mechanics of Deep Learning**" - 2 k€
- 2014 - "Progetto Giovani" 2014 from GNFM (Gruppo Nazionale di Fisica Matematica) to lead investigations on "**Molecular Parallel Processing: Rigorous results from Disordered Statistical Mechanics and Theory of Underpercolated Graphs**" - 2 k€
- 2012 - Academic scientific fundings from the University of Parma (maximum rank) - 2 k€
- 2010/11 - "Angelo della Riccia" grant to lead investigations on "**Reaction-Diffusion processes with applications to immune networks**" - 4 k€
- 2010/13 - FIRB (prot. RBFR08EKEV) for the project "**Dynamics and statistical mechanics of lymphocyte networks below the percolation threshold**" in collaboration with Sapienza University of Rome - 480 k€
- 2007/8 - "Angelo della Riccia" grant to lead investigations on "**Coherent and Incoherent Dynamics on discrete structures**" - 11 k€

#### GRANTS AS PARTICIPANT

- 2019 - **National Natural Science Foundation of China (NNSFC)** on "*First-passage problems in stochastic search with mobile target*" (Grant No. 60171009); coordinator: Junhao Peng (Guangzhou University).
- 2018 - **Fondi Ateneo Sapienza** on "*Problems in out-of-equilibrium statistical mechanics*" (prot. RM118164368D6841); coordinator: Giada Basile (Sapienza University of Rome).
- 2017 - **Fondi Ateneo Sapienza** on "*Modelling complex systems in the digital era*" (prot. RG11715C7CC31E3D); coordinator: Vittorio Loreto (Sapienza University of Rome).
- 2016 - **Fondi Ateneo Sapienza** on "*Mathematical-physics methods for evolution problems*" (prot. RM116154CD9961A3); coordinator: Dario Benedetto (Sapienza University of Rome).
- 2013 - **Progetto Giovani** from GNFM (Gruppo Nazionale di Fisica Matematica) on "*Statistical mechanics for molecular parallel processing*"; coordinator: Adriano Barra (Sapienza University of Rome).
- 2013 - **Spinner project** on "*Applications of inverse problems in bio-medical and public-health contexts*" supported by regione Emilia-Romagna; coordinator: Luca Zanni (University of Modena and Reggio).
- 2012 - **Fondi Ateneo Sapienza** on "*Application of statistical mechanics of complex systems to biological phenomena*"; coordinator: Adriano Barra (Sapienza University of Rome).
- 2011 - **Fondi Ateneo Sapienza** on "*Comparison between theory and experiment for complex statistical mechanics applied to the immune system*"; coordinator: Adriano Barra (Sapienza University of Rome).
- 2010, 2011, 2012 - participation to "**iniziativa specifica TO61**" on "*Biological applications of theoretical physics methods*" supported by Commissione IV of INFN; national coordinator: Michele Caselle (University of Torino).
- 2008 - **PRIN** (Progetti di Ricerca di interesse Nazionale) on "*Disorder and non-linearity in classical and quantum transport*"; national coordinator: Roberto Livi (University of Florence).

#### EDITORIAL BOARD MEMBERSHIP

2018 Invited **Guest Editor** (with A. Barra, P. Sollich, and L. Zdeborová) for the "**Journal of Physics A: Mathematical and Theoretical**" special issue on "**Machine Learning and Statistical Physics: Theory, Inspiration, Application**"

Since 2018 Member of the **Editorial Board** for "**Heliyon**" (Mathematics section)

Since 2018 Member of the **Editorial Board** for "**Frontiers in Physics**"

Since 2017 Member of the **Advisory Panel** for the "**Journal of Physics A: Mathematical and Theoretical**"

Since 2016 member of the **Scientific Committee** of "**Scienze & Ricerche**" (Mathematics section)

2015 **Editor** (with B. Tirozzi, G. Montani, A. Barra, and N. Carlevaro) for the volume "**Theory and Applications in Mathematical Physics**", World Scientific Publishing

## SOCIETY MEMBERSHIPS, AWARDS AND HONORS

- Selected as “**Communicator**” by Neural Computation (2019)
- From January 2019: member of **UMI** (Unione Matematica Italiana) and of **EWM** (European Women in Mathematics)
- Selected as “**EPS invited speaker**” at the workshop “Venice meeting on fluctuations in complex small systems” (2018)
- “**Outstanding Reviewers Awards**” from the *Journal of Physics A: Mathematical and Theoretical*, “in recognition of the high quality and timeliness of your reviews” (2016)
- From January 2013: member of **INdAM** (Istituto Nazionale di Alta Matematica)
- October 2009 - November 2013: member of **INFN** (Istituto Nazionale Fisica Nucleare)
- Best student of the A.Y. 2002/03, Department of Physics, University of Parma
- Several papers that I (co-)authored have been awarded by journal’s Editors and inserted in special collections. In particular, in the last five years:
  - E. Agliari, et al., *Retrieving infinite numbers of patterns in a spin-glass model of immune networks* (Europhys. Lett., 2017), selected for **Editor’s Choice** (2017) - Ref[68] in the full list of publications
  - E. Agliari, et al., *Retrieval Capabilities of Hierarchical Networks: From Dyson to Hopfield* (Phys. Rev. Lett., 2015), selected for **Europhysicsnews** (46/2, 2015) - Ref[54] in the full list of publications
  - E. Agliari, et al., *Meta-stable states in the hierarchical Dyson model drive parallel processing in the hierarchical Hopfield network*, selected by IOP for “**Highlights - A collection of outstanding research published in 2015**” and chosen for cover image by J. Phys. A (2015) - Ref[53] in the full list of publications
  - E. Agliari et al., *Immune networks: multitasking capabilities near saturation*, selected by IOP for “**Highlights - A collection of outstanding research published in 2013**” - Ref[46] in the full list of publications

## SUMMARY OF SCIENTIFIC ACHIEVEMENTS

	Web Of Science	Source Scopus	Google Scholar
<b>International Referred Publications</b>	79 (since 2005)	77	91
<b>Scientific Book (chapters)</b>		3	3 (since 2010)
<b>International Referred Proceedings</b>	4 (since 2007)	4	<b>7</b>
<b>Total Impact Factor</b>	192.6	198.1	-
<b>Total Citations</b>	1027	1072	1535
<b>Average Citations per Product</b>	12.4	12.8	16.9
<b>Average Citations per Year</b>	73.4	76.6	109.6
<b>H index</b>	17	17	23
<b>Invited Seminars and Talks in Workshops</b>		36	
<b>Invited lecturer for PhD schools/programs</b>		3	
<b>Research Gate Score</b>		35.4 (93th percentile)	

## ACADEMIC DUTIES

- A.Y. 2017/18, 2018/19: Member of the Committee for Placement for the Faculty of Science, Sapienza University of Rome
- A.Y. 2018/19: Member of the Teaching Committee for the course “Environmental Monitoring and Recovery”, Sapienza University of Rome
- A.Y. 2017/18, 2018/19: Member of the Committee for Orientation and Placement for the courses “Mathematics” and “Mathematics for Applications”, Sapienza University of Rome
- A.Y. 2016/17, 2017/18, 2018/19: Member of the Committee for Quality Managing and Assurance (Gestione dell’Assicurazione Qualità) for the course “Environmental Monitoring and Recovery”, Sapienza University of Rome
- September 2016: Room President for the admission test (Science), Sapienza University of Rome
- A.Y. 2016/17, 2017/18: Tutor for the Master course “Environmental Monitoring and Recovery”, Sapienza University of Rome

### SCHOOLS ATTENDED

- “**XLI Summer School on Mathematical Physics**”, 05-10 September 2016, Ravello (Italy)
- “**XXXIX Summer School on Mathematical Physics**”, 15-27 September 2014, Ravello (Italy)
- “**Boulder school for condensed matter and material physics**” on “Non-equilibrium Statistical Mechanics: Fundamental Problems and Applications”, 6-24 July 2009, Boulder University, Colorado (USA)
- “**École d’Été de Physique Théorique**” - session 85: “*Complex Systems*”, 3-28 July 2006, Université Joseph Fourier, Les Houches (France)
- “**International Summer School**” on “*Fundamental Problems in Statistical Physics XI*”, 4-17 September 2005, Katholieke Universiteit Leuven, European Centre La Foresta, Leuven (Belgium)
- “**Condensed Matter Summer School**”, organized by INFM and ISI Foundation on “*Single molecule Biophysics*” and “*Non-Equilibrium systems: the problem of turbulence in fluids and plasma*”, 3-28 September 2004, Villa Gualino, Torino (Italy)
- “**International School of Theoretical Physics**”, organized by INFN, 31 August - 4 September 2004, Centro S. Elisabetta, Parma (Italy)

### POPULARISATION OF SCIENCE

- E. Agliari, A. Barra, “Elementi di processazione di informazione nei sistemi biologici ed artificiali”, *Scienze&Ricerca* 50, 28-35 (2017)
- Collaboration to the project “Lauree Scientifiche” for high school students, at Sapienza University of Roma, Edition 2017
- A. Barra, E. Agliari, “Le reti del sistema immunitario da una prospettiva di meccanica statistica”, *Scienze&Ricerca* 34, 59-66 (2016)
- Collaboration to the project “La notte dei ricercatori” at University of Parma, 27 September 2013
- Invited talk “Scientific Careers” for high school students, Liceo Scientifico Statale “Giacomo Ulivi”, Parma, Editions 2007, 2010
- Invited talk “The role of a scientist” for undergraduate and high-school students, Centro S. Elisabetta, Parma 2007
- Collaboration to the project “Lauree Scientifiche” for high school students, at University of Parma, Editions 2006, 2007, 2010-12
- Laboratory “Meraviglie della Scienza. La cucina scientifica” at Festival della Scienza, Genova, 26 October – 7 November 2004

### ORGANIZED WORKSHOP

- Workshop “**Women of Mathematics**”, 07-21 December 2016, Sapienza University of Rome, Italy (co-organized with G. Basile, D. Benedetto, A. D’Orazio, A. Garroni, C. Malvenuto et al.)
- Workshop “**Mathematical Physics: Theory and Applications**”, 15-17 September 2014, Sapienza University of Rome, Italy (co-organized with A. Barra)
- ECCS satellite meeting “**Modeling the complexity of the immune system**”, 19 September 2013, Barcelona, Spain (co-organized with A. Annibale, A. Barra and A.C.C. Coolen)
- **XVIII Convegno Nazionale di Fisica Statistica e dei Sistemi Complessi**, 24-26 June 2013, University of Parma, Italy (co-organized with P. Buonsante, R. Burioni, D. Cassi, A. Vezzani)
- Workshop “**Physicists’ investigations in immunology**”, 15 November 2012, Sapienza University of Rome, Italy (co-organized with A. Barra)
- **XVII Convegno Nazionale di Fisica Statistica e dei Sistemi Complessi**, 20-22 June 2012, University of Parma, Italy (co-organized with P. Buonsante, R. Burioni, D. Cassi, A. Vezzani)

### INVITED SEMINARS AND CONTRIBUTIONS IN WORKSHOPS

- 23-25 September 2019: “Il Bad Wildbad meeting on random processes & applications”, Koenig Karls Bad (Germany), invited talk “**TBA**” [scheduled]
- 1-26 July 2019: “Predictability and control of evolution”, Nordita, Stockholm (Sweden), invited talk “**A statistical-inference approach to assess an ‘interaction’ pattern among migrating cells.**” [scheduled]
- 27 February 2019: Invited speaker at the CANES Cross-Disciplinary Approaches to Non-Equilibrium Systems) seminar

- series series ***“Hopfield networks beyond the Hebbian paradigm”***, King’s College London
- 7 December 2018: Invited seminar ***“Dreaming Neural Networks”*** at Kavli Institute for Systems Neuroscience, Trondheim (Norway)
  - 26 November 2018: Invited seminar ***“Rigorous Approaches to Neural Networks”*** at Department of Mathematics, University of Bologna (Italy)
  - 13-18 October 2018: “Venice Meeting on Fluctuations in small complex systems IV”, Palazzo Franchetti, Venice (Italy), invited talk ***“Collective features in biochemical reactions”***
  - 25-27 June 2018: “CONES2018: Frontiers of Non-Equilibriums Science”, King’s College, London [declined]
  - 20 June 2018: Invited seminar ***“Statistical inference tools to assess leukocyte migratory ability”***, CNR Nanotec, Lecce (Italy)
  - 28 May - 01 June 2018: “Search and problem solving by random walks: drunkards vs quantum computers”, Physikzentrum Bad-Honnef (Germany), invited talk ***“Search and Diffusion of Leucocytes on Lab-On-Chip”***
  - 25 April 2018: “AI days in Northumbria”, Northumbria University, Newcastle (United Kingdom), invited talk ***“Neural Networks from a stochastic dynamics perspective”***
  - 20 February 2018: “Statistical Mechanics and Applications VIII”, Department of Mathematics, University of Bologna (Italy), invited talk ***“Dreaming and Unlearning in Neural Networks”***
  - 4-6 May 2017: Invited talk ***“Statistical Mechanics of learning and retrieval”***, Assemblea GNFM, Montecatini (Italy)
  - 18-21 April 2017: “Critical Transitions in Complex Systems”, University of Salento (Italy), invited talk ***“Criticality in Graphs”***
  - 7 April 2017: Invited seminar for Mathematical Models for Applications (MoMA) ***“Neural Networks from a Statistical Mechanics perspective”***, Department of Mathematics, Sapienza University of Rome (Italy)
  - 13 December 2016: Invited seminar for Numerical Analysis ***“Analytical and Numerical Approaches to study Free-energy Minima of Associative Recurrent Neural Networks”***, Department of Mathematics, Sapienza University of Rome (Italy)
  - 17-18 November 2016: “Mathematical Models for Quantum and Classical Mechanics”, Mathematic Department, University of Florence (Italy), invited talk ***“Absorption and collision in branched structures”***
  - 11 March 2016: Invited seminar ***“Topological and Statistical-Mechanics properties of Dyson hierarchical systems”***, Institut Non Linéaire de Nice, Sophia-Antipolis (France)
  - 17 December 2015: Invited seminar ***“Information processing in biochemical networks”***, Computational Neuroscience Laboratory, École Polytechnique Fédérale de Lousanne, Lousanne (Switzerland)
  - 3-8 August 2015: “XIX Brazilian School of Probability”, São Sebastião-SP, (Brazil), invited talk ***“Statistical mechanics of hierarchical networks”***
  - 11 March 2015: “Workshop on Fractional Calculus and its Applications”, Mathematic Department, University of Roma Tre, Roma (Italy), Invited talk ***“Lévy flights with absorption and collisione in combs”***
  - 9 January 2015: Invited seminar ***“Biological information processing on hierarchical and scale free networks”***, at Institut de Neurosciences des Systèmes, Aix-Marseille Université, Marseille (France)
  - 5-7 November 2014: “4th Workshop in Stochastic Modeling”, Mathematic Department, University of São Paulo, São Carlos (Brazil), Invited talk ***“Epidemic spreading in inhomogeneous structures”***
  - 4 April 2014: Invited seminar ***“The infinite collision property on finite, random combs”***, Department of Mathematics, Sapienza University of Rome (Italy)
  - 16-20 September 2013: “European Conference on Complex Systems”, Barcelona (Spain), invited talk ***“Anergy and parallel processing in spin glass models of immune networks”***
  - 29 July - 1 August 2013: “Classical and Quantum transport in Complex Networks”, Bad-Honnef (Germany), invited talk ***“First-passage phenomena in branched structures”***
  - 3-8 June 2013: “Search and Exploration III”, Cargèse (France), Invited talk ***“Collisions and absorption on branched structures”***
  - 21 February 2013: Invited seminar ***“A Statistical mechanics perspective on Immune Networks”***, at NORDITA, Stockholm (Sweden)
  - 3 December 2012: Invited seminar ***“The statistical mechanics of collective behaviours in chemical kinetics”***, at Albert-Ludwigs-Universitaet, Freiburg (Germany)
  - 21 February 2012: Invited seminar ***“A Statistical mechanics perspective on Immune Networks”***, at SISSA, Trieste (Italy)
  - 1 December 2010: Invited seminar ***“A Hebbian approach to complex network generation and applications in theoretical immunology”***, Physics Department, University of Pisa (Italy)
  - 13 July 2010: Invited seminar ***“Statistical physics approach to Immune Idiotypic Networks”***, at Soft Matter and Biophysics Department, Ludwig-Maximilians-Universitaet München, (Germany).
  - 2-5 June 2010: “3<sup>rd</sup> Black Forest Focus on Soft Matter”, Breisach (Germany), invited talk: ***“Effects of Inhomogeneity on classical and quantum transport”***

- 15-20 November 2009: “*Statistical Mechanics on Random Structures*”, Banff International Research Station, Banff (Canada), invited talk: “**The autopoietic immune system: a statistical physics perspective**”
- 5-6 March 2009: “*Workshop on Statistical Mechanics and Applications III*”, Mathematics Department, University of Bologna, invited talk “**Diffusive Strategies in Group Competition**”
- 16-28 July 2008: “*Workshop on Statistical Mechanics and Applications II*”, Eurandom, Eindhoven (The Netherlands), invited talk “**Non-canonical Dynamics for the Ising model on random structures**”
- 10-14 March 2008: “YEP (Young European Probabilists) V”, Eurandom, Eindhoven (The Netherlands), invited talk “**Diffusive Thermal Dynamics for the Ising model on the Erdős-Rényi random graph**”
- 15 March 2007: Invited seminar “**Autocatalytic Reaction in Restricted Geometries: Extended Mean-Field Treatment and applications to Social Systems**”, at Brunel University, London (UK)
- 14-15 December 2006: “*Informal Meeting on Statistical Physics*”, SISSA, Trieste (Italy), invited talk “**Statistical models of binary reactions among Diffusing particles**”
- 21-23 June 2006: “*XI Convegno Nazionale Fisica Statistica*”, Physics Department, University of Parma (Italy), invited talk “**Efficiency of Information Spreading in a population of diffusing agents**”

#### OTHER CONTRIBUTIONS IN WORKSHOPS

- 2-7 September 2019: “XXI Workshop Unione Matematica Italiana (UMI)”, University of Pavia (Italy), invited talk “**Learning, Reinforcement and Remotion**” [scheduled]
- 5-7 October 2018: “Assemblea Scientifica del Gruppo Nazionale di Fisica Matematica”, at Montecatini Terme (Italy), talk: “**Apprendimento, Consolidamento e Rimozione**”
- 26-28 June 2017: “Bio-Math Modelling Workshop (MOBI-2017)”, at Istituto Nazionale di Alta Matematica, Rome (Italy), talk: “**The (biochemical) molecular interactions from a cybernetic perspective**”
- 01-02 October 2015: “Mathematical Models in Social Dynamics”, at Politecnico di Torino (Italy), talk: “**The role of migration is economic complexity**”
- 22-23 May 2014: “Biophysics@Rome2014”, at CNR Tor Vergata (Italy), talk: “**Statistical mechanics unveils collective behaviours in biochemistry**”
- 15-17 May 2014: “Assemblea Scientifica del Gruppo Nazionale di Fisica Matematica”, at Montecatini Terme (Italy), talk: “**Collective behaviours: from biochemical kinetics to cybernetics**”
- 21-23 September 2011: “XV Workshop on Statistical Mechanics and non-perturbative Field Theory”, at Physics Department, University of Bari (Italy), talk: “**Performance and breakdown of the immune system from a statistical mechanics perspective**”
- 9-11 September 2010: “BioPhys 2010”, at Arcidosso (Italy), sponsored talk “**Statistical physics approach to Immune Idiotypic Networks**”
- 28-30 May 2009: “*NET 2009 Evolution and Complexity*”, Sapienza University of Rome (Italy), poster contribution: “**Group Competition and Consensus Spreading**”
- 26-29 August 2007: “*Diffusion Fundamentals II*”, organized by University of L’Aquila, UCL (University College London) and University of Leipzig in L’Aquila (Italy), poster contribution “**Autocatalytic reaction-diffusion process in restricted geometries**”
- 16-18 July 2007: “*Fluctuation and Dissipation Phenomena in Driven Systems far from Equilibrium*”, Max Planck Institute, Dresden (Germany), poster contribution “**Heat conduction in a two-dimensional Ising model**”
- 17-20 September 2006: “*XXIV Convegno di Fisica Teorica e Struttura della Materia*”, organized by University of Trento, Levico Terme (Italy), poster contribution “**Universal Features of Information Spreading**”

#### SCIENTIFIC COMMITTEES, REVIEWER ACTIVITY

Reviewer for the following project founding institutions:

IMéRA: Institut d’études avancées d’Aix-Marseille (Foundation of Université d’Aix-Marseille)

Deutsche Forschungsgemeinschaft (German Research Foundation)

Swiss National Science Foundation

Romanian Research Programme

United Arab Emirates University Research Office

Czech Science Foundation

Member of the following evaluation committees:

Member of the Assessment Committee for the PhD programme in Neuroscience (Faculty of Medicine) at the Norwegian University of Science and Technology

Member of the Selection Committee for a Fellowship in the field of Mathematical Physics at the University of Salento (Italy)

Reviewer for international scientific journals:

Since 2006 I have served as reviewer for more than 30 international scientific journals (ISI) in the area of applied mathematics, mathematical physics and theoretical physics.

Member of the following workshop program committees:

CompleNet 2014 (5th Workshop on Complex Networks)

Socio-Economic Dynamics: Physics-based Agent Models to go beyond the representative agent paradigm (Satellite Meeting of ECCS'14)

**FULL LIST OF PUBLICATIONS (ISI)**

84. E.A., A. Barra, A. Moro, Multi-component variational principles for biochemical reactions, submitted
83. E.A., F. Alemanno, A. Barra, M. Centonze, A. Fachechi, *Deep Learning and Dense Associative Memories: detecting the Undetectable through redundant representation*, submitted
82. E.A., F. Alemanno, A. Barra, A. Fachechi, *Dreaming neural networks: rigorous results*, submitted to J. Stat. **2019**
81. E.A., F. Alemanno, A. Barra, A. Fachechi, *A novel derivation of the Marchenko-Pastur law through analog bipartite spin-glasses*, J. Phys. A (2019), in press
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In fede,  
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