

# DUCCIO FANELLI

<p><b>Date of birth:</b> <b>Nationality:</b> <b>Address:</b> Dipartimento di Fisica e Astronomia, University of Florence, via Sansone 1, Sesto Fiorentino, Florence <b>Email:</b> <a href="mailto:duccio.fanelli@unifi.it">duccio.fanelli@unifi.it</a> <b>Telephone:</b> -</p>
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## RESEARCH POSITIONS

- 2020 -** **Director of the Department of Physics and Astronomy** University of Florence, Florence, Italy (**from 1st November 2020**).
- 2020 -** **Director of the Centre for the Study of the Complex System (CSDC)** University of Florence, Florence, Italy.
- 2019 -** **Full Professor in Condensed Matter Physics** (permanent job) – Department of Physics and Astronomy, University of Florence, Florence, Italy.
- 2019-2020** Awarded the **Francqui Chair** 2019-2020.
- 2019** **Invited Researcher CNRS (niveau DR)**– Marseille, France (1 month).
- 2017** **Invited Researcher** – University of Namur, Belgium.
- 2013 -** **Associate Professor in Condensed Matter Physics** (permanent job) – Department of Physics and Astronomy, University of Florence, Florence, Italy.
- 2013** **Invited Professor** – Université d'Orléans Lyon, France (1 month).
- 2008** **Invited Professor** – Ecole Normale Supérieure (ENS) de Lyon, France (2 months).
- 2007 - 2012** **Associate Professor in Condensed Matter Physics** (permanent job) – Department of Energy “S. Stecco”, University of Florence, Florence, Italy. Three years confirmation stage passed in May 2011.
- 2006 - 2007** **Lecturer in Theoretical Physics** (permanent job)– Department of Physics, University of Manchester, UK. Teaching and research position. The research activity is aimed at establishing an independent unit with supervision of postdocs and PhD students.

- 2006**      **Senior Researcher** – SIDEC technologies AB, Stockholm, Sweden. Home page: [www.sidectech.com](http://www.sidectech.com). *Project Leader* of a project aimed at developing a simulator for the image formation in a Transmission Electron Microscope. The project involves the Department of Mathematics, Stockholm University, Sweden and the Department of Cell and Molecular Biology, Karolinska Institute, Stockholm, Sweden.
- 2004 - 2006** **Contracted Professor** – Department of Energetic “S. Stecco”, University of Florence, Florence, Italy. Position sponsored by the Italian research council within the framework of the “Rientro dei Cervelli” program.
- 2004 - 2006** **Researcher** – Department of Cell and Molecular Biology, Medical Nobel Institute, Karolinska Institute, Stockholm, Sweden.
- 2002-2004** **Postdoc** – Department of Cell and Molecular Biology, Medical Nobel Institute, Karolinska Institute, Stockholm, Sweden.
- 2002-2004** **Researcher** - SIDEC technologies AB, Stockholm, Sweden. Molecular imaging.
- 1999**      **Visiting Researcher** – Observatoire de Nice, Nice, France (3 months).

### EDUCATION

- 1997-2002** **Ph.D.** in Numerical Analysis and Computer Science, Royal Institute of Technology (KTH) and University of Stockholm, Sweden: “*Self-gravitating Systems and Beam Dynamics in a Storage Ring*”. Supervisor: Erik Aurell (Stockholm).
- 1997-2002** **Licentiate Philosophie** in Numerical Analysis and Computer Science, University of Stockholm, Sweden: “*On the dynamics of self-gravitating systems and a new interpretation of the resonance theory for betatron motion*”. Supervisor: Erik Aurell (Stockholm). Recognised as a pre-doctoral degree: it is equal to completion of the coursework required for a doctorate and a dissertation which is formally equivalent to half of a doctoral dissertation.
- 1989-1996** **Laurea in Physics**, University of Florence, Italy: “*Regime non lineare della interazione plasma-fascio caldo di elettroni (Non linear warm beam - plasma instability)*”. Supervisors: Yves Elskens (Marseille) and Stefano Ruffo (Florence). Thesis work carried out at the University of Marseille (France).
- 1993-1994** **Course of Maitrise**, European Erasmus exchange, University of Provence, Marseille, France.

### HABILITATION

- 2017**      **Italian scientific habilitation** (ASN) to full professor for section 02/A2 – Theoretical physics of fundamental interactions.

**2017**            **Italian scientific habilitation** (ASN) to full professor for section 02/B2 – Theoretical physics of condensed matter.

### **MAIN RESEARCH INTERESTS**

Application of statistical mechanics and non linear physics to biology and life sciences in general. Stochastic models, simulations (Gillespie) and analytical techniques (van Kampen and Kramers-Moyal expansion). Patterns formation in biology. Statistical mechanics and out-of-equilibrium dynamics in systems subject to long-range forces. Vlasov equation, kinetic theory and plasma physics. Dynamics of Free Electron Laser.

### **SUPERVISOR AND LECTURING TRACK RECORDS**

*Postdocs:* **Francesca Di Patti** (2013-2018); **Joseph Daniel Challenger** (2013-2014).

*PhD thesis:*

- **Andrea Antoniazzi**: “Dynamics of systems with long-range interactions: from FEL physics to the HMF model”, Non-linear dynamics and complex systems, 2003-2006 (jointly with S. Ruffo, Florence).
- **Andrea Guazzini**: “Opinion dynamics through agents models” Non-linear dynamics and complex systems 2005- 2008 (jointly with F. Bagnoli).
- **Francesca Di Patti** : "Finite size effects in stochastic models of population dynamics: applications to biomedicine and biology", Non-linear dynamics and complex systems, 2005- 2008. *Winner of the award for the best PhD thesis at the University of Florence 2008.*
- **Antonia Ciani**: “Dilution, finite size effects and out-of-equilibrium dynamics in mean field models” Physics, 2005- 2009.
- **Pasquale Laise**: “Stochastic models in tumor dynamics” Non-linear dynamics and complex systems , 2009-2012 (jointly with A. Arcangeli).
- **Alessio Turchi**: “Dynamics and statistical mechanics of systems with long range interactions”. Non Linear dynamics and complex systems, 2009-2012 (co-tutelle, Université de Provence Marseille, France).
- **Claudia Cianci**: “Finite size effects in stochastic biological models”. Non-Linear dynamics and complex systems, 2011-2014.
- **Malbor Asslani**: “Stochastic Turing patterns and wave propagation on a Network”. Applied Mathematics, 2011-2014.

- **Marta Galanti**: “Molecular diffusion under crowded conditions”. Non-Linear dynamics and complex systems, 2012-2015 (co-tutelle, Université de Orleans, France).
- **Clement Zankoc**: “The role of external and endogenous noise in neural network dynamics and statistics”, Physics 2015-2018 (jointly with Roberto Livi).
- **Giulia Cencetti**: “Dynamics on complex networks: modeling the form to shape the substance”, Non-Linear dynamics and complex systems, 2015-2018 (jointly with Franco Bagnoli, Luigi Chisci, Giorgio Battistelli).
- **Maxime Lucas**: “Synchronization and stability in nonautonomous oscillatory systems”, Physics 2015 - 2018 (jointly with Aneta Stefanovska, University of Lancaster).
- **Sara Nicoletti**: “Neuromorphic computing”, Non-Linear dynamics and complex systems, 2017 -
- **Adam Ihusan**: “Reaction diffusion on network”, Non-Linear dynamics and complex systems, 2017 - [special grant awarded by the Dean to foster interdisciplinary activities] (jointly with Giacomo Innocenti).
- **Lorenzo Buffoni**: “Quantum Random Walks”, Non-Linear dynamics and complex systems, 2017 (jointly with Luigi Chisci, Giorgio Battistelli, Filippo Caruso).

*MSc thesis:*

**Romain Bachelard**, "An attempt to control the Free Electron Laser dynamics", Physics at the Université de Provence, France (2005); **Pietro De Anna**, "Collective dynamics in a protocell model: analytical and numerical study", Laurea in Physics, Università di Firenze (2009); **Tommaso Biancalani**, "Turing instability in stochastic models of population dynamics", Laurea Magistrale in Physics, Università di Firenze (2010); **Claudia Cianci**, "Stochastic dynamics and finite size corrections in a scheme of autocatalytic reactions", Laurea Magistrale in Mathematics, Università di Firenze (2010); **Malbor Asllani**, "Quasi-Stationary States and the Lynden-Bell theory of violent relaxation", Laurea Magistrale in Mathematical Engineering, Università di Firenze (2011); **Caterina Borgiotti**, "Solitons and the method of harmonic balance", Laurea Magistrale in Automatic Engineering, Università di Firenze (2011) *Winner of "Piero Ciullini" award for the best Laurea Thesis in Engineering* (Ordine degli Ingegneri della Provincia di Firenze); **Giulio Pompili** "Diffusion in a crowded environment: theory and experiments", Laurea Magistrale in Automatic Engineering, Università di Firenze (2011); **Laura Cantini** "Stochastic dynamics of calcium channels: a-spatial model", Laurea Magistrale in Mathematics (2012); **Emma Massi** "Stochastic dynamics of calcium channels: spatial model", Laurea Magistrale in Mathematics (2012); **Gwendoline Planchon** "Reaction diffusion dynamics on complex networks", Applied Mathematics, Université de Namur, Belgium (2014) *Awarded as the Best Thesis of the University of Namur*; **Florent Cottier**, "Reaction diffusion models on long range networks" Université de Provence, Marseille, France (2014); **Daniel Maria Busiello** "Pattern formation in multiplex" Università di Pisa (2014); **Silvia Contemori** "Multiple scale theory of

reaction-diffusion systems on directed networks”, Applied Mathematics (2015); **Filippo Miele** “Pattern formation from limit cycles: a multiple time scale approach” Laurea Magistrale in Physics (2015); **Laura Lavacchi** “Deterministic and stochastic patterns in a cyanobacterium model” Laurea Magistrale in Physics (2016); **Niccolò Zagli** ”Noise driven neuromorphic tuned amplifier” Laurea Magistrale in Physics (2017) *Winner of the “Bardazzi award” for the best technological thesis of the University of Florence (2018)*; **Riccardo Muolo** “Turing pattern and non normal network topology” Laurea Magistrale in Mathematics (2018) *Award among the best thesis of the Department of Mathematics 2018*; **Lorenzo Tinacci** “Stochastic Michaelis Menten reactions” Laurea Magistrale in Chemistry (2019); **Valentina Buonfiglio** “Circadian rythms in Anabaena: model vs. experiments” Laurea Magistrale in Physics, (2019); **Lorenzo Chicchi** “Inverse problems for neuroscience applications”, Laurea Magistrale in Physics of Complex Systems (Torino) (2019); **Giacomo Chiti**, “Interacting random walkers on a lattice: dynamical absorbing traps” Laurea Magistrale in Physics, (2020); **Walter Nocentini** “Optimization procedures for projective classifications”, Laurea Magistrale in Physics, (2020); **Lorenzo Giambagli**, “Spectral machine learning”, Laurea Magistrale in Physics, (2020).

Bachelor thesis:

**Leonardo Miele** “Stochastic Oscillations in a prey-predator model”, Laurea Triennale in Fisica e Astrofisica (2014); **Lorenzo Maffi** ”Trophic systems and bifurcations”, Laurea Triennale in Fisica e Astrofisica (2014); **Riccardo Muolo** “Turing Instability on continuum and discrete support” Laurea Triennale in Fisica e Astrofisica (2015); **Lorenzo Chicchi** “Stochastic dynamic of Cape Rodney-Okakari Point marine ecosystem”, Laurea Triennale in Fisica e Astrofisica (2017); **Alessio Focardi** “One-dimensional self-gravitating systems in an expanding medium”, Laurea Triennale in Fisica e Astrofisica (2017); **Lorenzo Giambagli** “A diffusive model for visual hallucination” Laurea Triennale in Fisica e Astrofisica (2018); **Claudio Pereti** “Ginzburg Landau equation on a time varying networks” Laurea Triennale in Fisica e Astrofisica (2018); **Luca Tolve** “Fluttuazioni di energia in un sistema classico fuori dall’equilibrio” Laurea Triennale in Fisica e Astrofisica (2019) (jointly with Michele Campisi); **Luca Governini** “Modelli macroscopici esatti di popolazioni neurali interagenti” Laurea Triennale in Fisica e Astrofisica (2019) (jointly with Simona Olmi).

I taught graduate and undergraduate courses in Classical Physics, Statistical Mechanics, Theory of Stochastic Systems, Chaos, Non-linear Physics, Numerical Analysis, Molecular Imaging.

During my stay in **Manchester as staff lecturer** (2006-2007) I taught a course on **Plasma Physics** (24 hours/semester) and gave Tutorials (3 hours/week both semesters) on **Quantum Mechanics, Atomic Physics and Statistical Mechanics**.

Except for the period I spent in the UK, see above, I have been teaching fundamental physics - Classical Mechanics and/or Electromagnetism - at the School of Engineering from 2004 to present. In the following a **detailed list of the courses taught over the last academic years** in Florence is provided:

#### **Academic year 2019-2020**

- 1) Electromagnetism, Mechanical Engineering, 60 hours, 250 students.
- 2) Physics of Complex Systems, 50 hours, 25 students.

#### **Academic year 2018-2019**

- 1) Electromagnetism, Mechanical Engineering, 60 hours, 200 students.
- 2) Physics of Complex Systems, 50 hours, 15 students.

#### **Academic year 2017-2018**

- 3) Electromagnetism, Mechanical Engineering, 60 hours, 200 students.
- 4) Physics of Complex Systems, 50 hours, 15 students.

#### **Academic year 2016-2017**

- 1) Mechanics, Environmental and Civil Engineering, 60 hours, about 100 students.
- 2) Electromagnetism, Environmental and Civil Engineering, 60 hours, 100 students.
- 3) Physics of Complex Systems, 30 hours, 15 students.

#### **Academic year 2015-2016**

- 1) Mechanics, Environmental and Civil Engineering, 60 hours, about 100 students.
- 2) Electromagnetism, Environmental and Civil Engineering, 60 hours, 100 students.
- 3) Physics of Complex Systems, 30 hours, 15 students.

#### **Academic year 2014-2015**

- 1) Mechanics, Environmental and Civil Engineering, 60 hours, about 100 students.
- 2) Electromagnetism, Environmental and Civil Engineering, 60 hours, 100 students.
- 3) Physics of Complex Systems, 30 hours, 15 students.

#### **Academic year 2013-2014**

- 1) Mechanics and Electromagnetism, Environmental Engineering, 90 hours, about 300 students.
- 2) Electromagnetism, Civil Engineering, 60 hours, 200 students.

#### **Academic year 2012-2013**

- 1) Mechanics and Electromagnetism, Environmental Engineering, 90 hours, about 100 students.
- 2) Electromagnetism, Civil Engineering, 30 hours, 100 students.
- 3) Physics of Complex Systems, 50 hours, 5 students.

#### **Academic year 2011-2012**

- 1) Mechanics and Electromagnetism, Environmental Engineering, 90 hours, about 100 students.
- 2) Electromagnetism, Civil Engineering, 30 hours, 50 students.
- 3) Physics of Complex Systems, 10 hours, 15 students.

#### **Academic year 2010-2011**

- 1) Mechanics and Electromagnetism, Environmental Engineering, 90 hours, about 100 students.
- 2) Mechanics and Electromagnetism, Civil (“Edile”) Engineering, 90 hours, about 200 students.

#### **Academic year 2008-2009**

- 1) Mechanics and Electromagnetism, Environmental Engineering, 90 hours, about 100 students.
- 2) Dynamical Systems, Master in Environmental Engineering, 50 hours, 5 students.
- 3) Dynamical Systems, Automation and Control Engineering, 50 hours, 10 students.

#### **Academic year 2005-2006**

- 1) Mechanics and Thermodynamics, Environmental Engineering in Prato, 60 hours, about 50 students.

#### **Academic year 2004-2005**

- 1) Mechanics and Thermodynamics, Environmental Engineering in Prato, 60 hours, about 50 students.

#### **Short lecture classes (miscellanea):**

- I. “*La fisica di tutti i giorni (Everyday Physics)*” a.a. 2004/2005 (together with F. Bagnoli, A. Guarino, S. Ruffo 1), University of the Third Age, Florence, Italy;
- II. “*La psicostoriografia di Asimov è possibile? Una introduzione ai sistemi complessi (Introduction to Complex Systems)*” a.a. 2011/2012 (together with F. Bagnoli, 10 hours), University of the Third Age, Florence, Italy.

### **PATENTS**

- 1) “Simulator for image formation in Electron Microscope”, Swedish patent 0402603-5.
- 2) “Method for simulating functional dynamics of biomolecules”, PCT International Application

### **REFEREE and EDITORIAL ACTIVITY**

Nature, Nature Communications, Nature Scientific Reports, Physical Review Letters, Physical Review E, Physica A, Physica D, Transport Theory and Statistical Physics, Communications in Nonlinear Science and Numerical Simulations, Journal of Theoretical Biology.

- **Member of the Editorial Board** of *Frontiers in Fractal Physiology* (since 2010);
- **Associate Editor** of *Communications in Nonlinear Science and Numerical Simulations (CNSNS)*, Elsevier (since 2011);
- **Academic Editor** of *Plos One* (since 2018).

### **ADMINISTRATIVE DUTIES**

- a) Reference contact for the node based in Florence of the Italian Chapter on Complex Systems (CSS/Italy) of the international Complex System Society (starting in **2018**).
- b) Member of the Committee in charge for the writing of the Departmental proposal submitted to the National call for “Dipartimenti di Eccellenza” (**2017**).
- c) Member of the Steering Committee (*Comitato di Indirizzo e Autovalutazione, CIA*) of the Department of Physics and Astronomy, University of Florence **2014-present**.
- d) Responsible for the Research Unit “Complex Systems” (ex 60%), Department of Physics and Astronomy, University of Florence, **2014-present**.
- e) Coordinator and Member of the Teaching Committee (*Commissione Carichi Didattici*) of the Department of Physics and Astronomy, **2014-present**.
- f) Responsible for the framework agreement between the University of Florence and the Ecole Normale Supérieure de Lyon, **2015-present**.
- g) Member of the PhD School (*Collegio dei Docenti*) of the Department of Informatics,



University of Florence **2015 - present**

- h) Member of the International PhD program (*Collegio dei Docenti*) in Atomic and Molecular Photonics, **2012-2014**.
- i) Member of the PhD School (*Collegio dei Docenti*) in Non Linear Dynamics and Complex Systems (*Collegio dei Docenti*), School of Engineering, University of Florence **2008 - 2009**.
- j) Delegate of the Department of Physics and Astronomy in the board of the Science School (“Scuola di Scienze Matematiche Fisiche e Naturali”), **2016**.
- k) Member of the Council (*Giunta*) of the Environmental Engineering course **2008-2013**.
- l) Member of the Council (*Giunta*) of the Department of Energetic at the Faculty of Engineering of the University of Florence **2010-2012**.
- m) Erasmus coordinator (*Delegato Erasmus*) for the Environmental Engineering course **2007-2013**.
- n) Member of the Committee for the Quality Assessment (*Gruppo di Autovalutazione, GAV*) of the Environmental Engineering courses **2010-2013**.
- o) Member of the Steering Committee for the management of the agreement between the University of Florence and the University Sts Cyril and Methodius in Skopje (Macedonia) for shared educational paths in study courses in the field of Environmental, Resources and Territory Engineering and the for mutual recognition of degree titles, **2010-2013**.
- p) Contact person at the University of Florence for AXA Funds (100 MEuro over 5 years), **2008-2009**.

### **COMMITTEES (PhD defense, Grants)**

- 1) Member of the PhD Committee of O. Bui’s PhD thesis, University of Marseille, Marseille, France (2020).
- 2) Member of the PhD Committee of I. Malvestio’s PhD thesis, Barcelona University, Barcelona, Spain (2019).
- 3) Member of the PhD Committee of P. Clusella’s PhD thesis, Aberdeen University, Scotland, UK (2019).
- 4) Member of the PhD Committee and external referee of E. Satuvuori ’s PhD thesis, Vrije Universitet, Amsterdam, Netherland. (2018).
- 5) External referee of G. Thomas's PhD thesis, IISER Mohali, India (2014).
- 6) Member of the PhD Committee and external referee of F. Sicard's PhD thesis, University Pierre et Marie Curie, Paris, France. (2010).
- 7) Member and external referee of the several PhD Committees in Italy (Florence, Padova,...).

- 8) Member of **five** selection Committees for “Ricercatori di tipo A/B” (Researcher), respectively in Padova (2015), Florence (2017) and Florence (2018), Lucca (2018), Florence (2020).
- 9) Member of a selection Committee for Full professor in Padova (2020).
- 10) Member of a selection Committee for “Ricercatore” (CNR) Florence (2015).
- 11) Reviewer for PRIN, funded under the Italian research scheme (Italy).
- 12) Reviewer for ANR (France).
- 13) Reviewer for Rita Levi Montalcini grants, funded under the Italian research scheme (Italy).

### INVITED TALKS

- 1) Satellite of StatPhys 27 on “Quantum and Classical System with Long-range interactions”, International Institute of Physics Universidade Federal do Rio Grande do Norte **Natal/RN, Brazil** 15-19 July 2019 (Invited)
- 2) “Stochastic dynamics in networks of excitatory-inhibitory units”, Physcon 2017, **Firenze, Italy** 17-19 July 2017 (Invited).
- 3) “Noise driven neuromorphic tuned amplifier”, XXII Convegno Nazionale di Fisica Statistica e Sistemi Complessi, **Parma, Italy**, 28-30 June 2017 (Invited).
- 4) Workshop on “Synchronization and dynamical phase transitions in out of equilibrium complex systems”, **Parma, Italy**, 2 December 2015 (Invited).
- 5) Workshop on “Meccanica Statistica e Termodinamica di Nonequilibrio” Castel Cellesi (Bagnoregio), **Viterbo, Italy** 31 August-4 September 2015 (Invited).
- 6) “Reaction diffusion patterns on complex directed graphs”, FISMAT 2015 Italian National Conference on Condensed Matter Physics, **Palermo, Italy**, 28 September 2015 - 2 October 2015 (Invited).
- 7) “Tutorial on deterministic and stochastic Turing patterns”, Interdisciplinary Symposium on Complex systems ISCS’14, 15-18 September 2014, **Firenze, Italy** (Invited).
- 8) “Deterministic and stochastic pattern formation for reaction diffusion models on networks”, XIX Convegno Nazionale di Fisica Statistica e Sistemi Complessi, **Parma, Italy** 25-27 June 2014 (Invited).
- 9) “Physics meets biology: from single molecule to population dynamics” Single Protein dynamics in cellulose, Okinawa 21-25 Aprile 2014, **Okinawa, Japan** (Invited) <https://groups.oist.jp/spdc/invited-speakers>.
- 10) “Modified diffusion equation from microscopic exclusion processes” Macromolecular crowding effects in cell biology: models and experiments, **Orleans, France** 24-25 October 2013 (Invited) <http://dirac.cnrs-orleans.fr/~piazza/Scientificprogram.html>
- 11) “Stochastic Dynamics of Autocatalytic Equations”, Protocells Back to the Future Workshop in the 12th European Conference on Artificial life (ECAL 2013) **Taormina, Italy** 2-6 September 2013 (Invited)

- 12)“Macroscopic order from microscopic molecular noise” Workshop SAPER: System Biology and Human Diseases, **Firenze, Italy** November 2013 (Invited).
- 13)“Multispecies diffusion from individual based stochastic models” Crowding 2012, Monte Verita’, **Ascona, Switzerland** 10-14 June 2012 (Invited).
- 14)“Heat transfer and quasi-stationary states in a canonical version of the HMF model” Equilibrium and out-of-equilibrium properties of systems with long-range interactions CECAM workshop, **Lyon, France** 27-31 August 2011 (Invited).
- 15)“Contributo dei modelli matematici per lo studio sui tumori infantili” Workshop le nuove frontiere per la lotta contro i tumori solidi infantili, Ospedale e Fondazione Meyer **Firenze, Italy** 29 October 2011 (Invited).
- 16)“Stochastic models and patterns formation”, Convegno nazionale di meccanica statistica e teoria dei campi non perturbativa, **Bari , Italy** September 2011 (Invited).
- 17)“Stochastic Patterns formation and Diffusion” Chaos Complexity and Transport CCT11, **Marseille, France** 23-27 March 2011 (Invited) <http://cct11.cpt.univ-mrs.fr/index/invitedspeakers>
- 18) “Stochastic models and the Gillespie algorithm”, Lecturer at the Summer School on Computational Nanotechnology **Gdansk, Poland**, August 2011 (Invited).
- 19)“Simplified approaches to opinion dynamics modelling” Modelling Complex Systems, **Manchester, UK**, 21-23 June 2010 (Invited)
- 20)“Collective and microscopic dynamics in mean-field Hamiltonian models” Workshop on Nonlinear dynamics and structure formation in complex systems: challenges and open problems for modern physics, **Frascati, Italy** 21 September 2009 (Invited).
- 21)“Stochatsic protocells models” Biophys09 - Biology and Beyond, **Arcidosso, Italy**, September 2009 (Invited).
- 22)“Quasi stationary states in systems with long range interactions” 12th Marcel Grossmann Meeting On General Relativity (MG12), **Paris, France**, July 2009 (Invited).
- 23)“Quasi stationary states and out-of-equilibrium phase transitions in mean field dynamics” SigmaPhi 2008 International Conference in Statistical Physics, **Crete, Greece** 14-18 July 2008 <http://www.sigmaphi.polito.it/2008/html/invited.html> (Invited)
- 24)“Vesicle growth and instability” Protocell modeling workshop, **Venezia, Italy** European Center for Living Technology 10-12 March 2008 (Invited).
- 25) “Opinion dynamics modeling: role of affinity” Workshop on Complex Systems, **Edinburgh, UK**, November 2007 (Invited).
- 26)“Lynden-Bell approach to the QSS in the HMF model” Dynamics and Thermodynamics of Systems with long range interactions: theory and experiments, **Assisi, Italy** 4-8 July 2007 (Invited).
- 27)“On the emergence of Quasi-Stationary States: the case of the Free-Electron Laser” Chaos Complexity and Transport, **Marseille, France** 4-8 June 2007 (Invited) <http://cct07.cpt.univ-mrs.fr/Program.php>
- 28)“Quasi stationary states in long range interacting systems” Workshop on Theory of Hamiltonian Control, **Frejus, France** December 2006 (Invited).
- 29)“Dinamica delle interazioni molecolari” XXVIII Congresso Nazionale della Società Italiana di Patologia **Pavia, Italy** 19-22 September 2006 (Invited).

- 30) "Large scale dynamics of antibodies from tomographic data" X Convegno Nazionale di Fisica Statistica e Sistemi Complessi, **Parma, Italy** 29 June - 1 July 2005 (Invited).
- 31) "Cryo-Electron Tomography: visualizing individual biomolecules" Biology School 2 "Models of complex biological systems", **Firenze, Italy** February 3 - 5, 2003 (Invited).

- Several contributed talks (>**35**) delivered at National and International conferences.
- Several talks (>**30**) delivered **upon invitation** at International Universities and Research Institutes, as e.g. Karolinska Institute, Manchester University, ENS Lyon, Université Claude Bernard Lyon, Université de Marseille, KTH Stockholm, Mittag Leffler Institute in Stockholm, Université of Namur,...

### **SCIENTIFIC COMMITTEES AND CONFERENCE ORGANIZATION** (selection)

- Scientific Committee of "Macromolecular crowding effects in cell biology: models and experiments" Orleans, France, 24-25 October 2013 <http://dirac.cnrs-orleans.fr/~piazza/index.html>.
- Scientific Committee di Reaction Kinetics in Soft and Condensed Matter 2014, Orleans (France), 1-4 July 2014 <http://dirac.cnrs-orleans.fr/~piazza/RKCM2014/index.html> 01/07/2014-04/07/2014
- Organizing Committee of "Biophys'15 From Physics to Biology and Beyond" 8-11 September 2015 Firenze (Italy). <http://biophys2015.complexworld.net/committees>
- "First Cosmos School and Workshop", Galileo Galilei Institute for Theoretical Physics, Arcetri, Firenze (Italy) 16-25 November 2015 [http://www.uni-potsdam.de/cosmos-itn/?page\\_id=613](http://www.uni-potsdam.de/cosmos-itn/?page_id=613)
- Program Committee Complexis 2016 - Roma (Italy) 22-24 April 2016 <http://www.complexis.org/ProgramCommittee.aspx?y=2016> 22/04/2016-24/04/2016
- Organization of the Satellite "Self-organized patterns on complex networks" - Conference of Complex Systems 2016 (CCS'16) - Amsterdam (Netherland) 19-22 September 2016. <http://complex.ffn.ub.es/~sop16/> 21/09/2016-21/09/2016
- International Program Committee of the 8th International Scientific Conference on Physics and Control 17-19 July 2017 Firenze, Italy. <http://physcon2017.com>
- Organizing Committee of the XXII Convegno Nazionale di Fisica Statistica e Sistemi Complessi, Parma (Italy), 28-30 June 2017
- Program Committee Complexis 2018 - Madeira (Portugal) 20-21 March 2018 <http://www.complexis.org/ProgramCommittee.aspx>
- Program Committee AMCOS (Analysis and Modeling of Complex Oscillatory Systems), Barcelona (Spain) 19-23 March 2018.
- Organizing Committee of Compeng 2018 - Workshop on Complexity in Engineering-Florence (Italy) 10-12 October 2018.

- Program Committee Complexis 2019 - Heraklion, Crete (Greece) 2-4 May 2019 <http://www.complexis.org/ProgramCommittee.aspx>
- Organizing Committee of the XXIV Convegno Nazionale di Fisica Statistica e Sistemi Complessi, Parma (Italy), 24-26 June 2019.
- Organizing Committee of the XXII Convegno Nazionale di Fisica Statistica e Sistemi Complessi, Parma (Italy), 28-30 June 2017
- Organizing Committee of Netsci 2020, Rome, Italy.

## GRANTS

- **"Rientro dei Cervelli"** program 2004: "Wave and particles interaction: on the dynamics of a free electron laser" (Budget about 80000 Euro) 31/08/2004-31/01/2007
- **2006-2007 Grant financed by FUNDP** (now **UNamur**), Namur, Belgium to favour the collaboration between Italy and Belgium. Budget 5600 Euro. Responsible for the node in Florence.
- **Galileo Program 2007-2008** "Studio e controllo di modelli con un gran numero di particelle in interazione" ("N-body models: Dynamics and control.") Franco-Italian University.
- **2009-2011 Grant financed by FUNDP** (now **UNamur**), Namur, Belgium to favour the collaboration between Italy and Belgium. Budget 7000 Euro. Responsible for the node in Florence.
- **2010 Project "La fisica statistica al servizio della biologia"** financed by **Fondazione Ente Cassa di Risparmio di Firenze** - Year I - Budget 25000 Euro. Principal investigator.
- **Program Vinci 2010** - Chapter II. Grant for mobility of PhD thesis in "cotutelle" (France-Italy). Budget 4500 Euro.
- **2010-2013** Member of the EU project RECOGNITION (ICT) Self-Awareness in Autonomic Systems Initiative (AWARENESS), Future Emerging Technology del EU 7th Framework Programme (Florence node, responsible F. Bagnoli).
- **2011 Project "La fisica statistica al servizio della biologia"** financed by **Fondazione Ente Cassa di Risparmio di Firenze** - Year II - Budget 25000 Euro. Principal investigator.
- **Prin 2009** - Local responsible locale dell'unità - Budget 58953 Euro - 24 months.
- **2012 Project "La fisica statistica al servizio della biologia"** financed by **Fondazione Ente Cassa di Risparmio di Firenze** - Year III - Budget 12500 Euro. Principal investigator.
- **2014-2015-2016** "Theoretical models of diffusion in crowded and confining environments: applications to intercellular transport" **COST Project (CNRS)** - Cooperation between Italy and France. Budget 18000 Euro. Responsible for the Italian node.
- **Prin 2012** - Local responsible locale dell'unità - Budget 49661 Euro - 36 months.
- **2014 Project "La medicina della complessità: il ruolo del microbioma intestinale e delle sue alterazioni farmaco-indotte in patologie complesse di diversa natura."** financed by

**Fondazione Ente Cassa di Risparmio di Firenze** with Prof. A. Arcangeli, Prof. Gian Maria Rossolini, Dr. Alberto Magi. Budget 48000 Euro.

- **2014-2018** Principal Investigator of the **ITN COSMOS project, Horizon 2020** (Marie Sklodowska-Curie grant agreement No 642563). The project is based on collaboration between 8 European Universities and 8 industrial partners. Budget 516122 Euro over 4 years. (<http://www.uni-potsdam.de/cosmos-itn/>)
- **2018-2021** Special grant of the University of Florence to foster interdisciplinary research (jointly with G. Innocenti). The grant cover the costs of a PhD student over three years. Budget 75000 Euro.
- **2018-2019** Project “Neuromorphic amplifiers” financed by **Fondazione Ente Cassa di Risparmio di Firenze - Year I** - Budget 10000 Euro. Principal investigator.

## PUBLICATIONS

### Refereed Papers:

1. I. Adam et al. “Inferring network structure and local dynamics from neuronal patterns with quenched disorder” *Chaos, Solitons & Fractals* **140**, 110235 (2020).
2. M. Asllani, T. Carletti, D. Fanelli, P.K. Maini “A universal route to pattern formation in multicellular systems” *The European Physical Journal B* **93** (7), 1-11 (2020).
3. V. Latora, T. Carletti, M. Asllani, D. Fanelli “Nonlinear walkers and efficient exploration of congested networks” *Physical Review Research* (2020).
4. T. Carletti, D. Fanelli, F. Piazza “COVID-19: The unreasonable effectiveness of simple models” *Chaos, Solitons & Fractals* **5**, 100034 (2020).
5. D. Fanelli, F. Piazza, “Analysis and forecast of COVID-19 spreading in China, Italy and France” *Chaos, Solitons & Fractals* **134**, 109761 (2020).
6. G. Cencetti, F. Battiston, T. Carletti, D. Fanelli “Generalized patterns from local and non local reactions” *Chaos, Solitons & Fractals* **134**, 109707 (2020).
7. C. Pereti, D. Fanelli “Stabilizing Stuart-Landau oscillators via time-varying networks” *Chaos, Solitons & Fractals* **133**, 109587 (2020).

8. T. Carletti, F. Battiston, G. Cencetti, D. Fanelli “Random walks on hypergraphs” *Physical Review E* **101** (2), 022308 (2020).
9. R. Muolo, M. Asllani, D. Fanelli, P.K. Maini, T. Carletti “Patterns of non-normality in networked systems” *Journal of theoretical biology* **480**, 81-91 (2019).
- 10.S. Nicoletti, D. Fanelli, et al. “Resilience for stochastic systems interacting via a quasi-degenerate network” *Chaos: An Interdisciplinary Journal of Nonlinear Science* **29** (8), 083123 (2019).
- 11.I. Adam, D. Fanelli, T. Carletti, G. Innocenti “Reactive explorers to unravel network topology” *Europ. Phys. J B* **92** **99** (2019).
- 12.C. Zankoc, D. Fanelli, F. Ginelli, R. Livi, “Desynchronization and pattern formation in a noisy feedforward network” *Phys. Rev E* **99** (1) 012303 (2019)
- 13.M. Lucas, D. Fanelli, A. Stefanovska “Nonautonomous driving induces stability in network of identical oscillators” *Phys Rev E* **99** (1) 012309 (2018).
- 14.R. Arbel-Goren, F. Di Patti, D. Fanelli, J. Stavans, “Noise seeded developmental pattern formation in Filamentous Cyanobacteria” *Life* **8** 58-70 (2018).
- 15.S. Nicoletti, N. Zagli, D. Fanelli, R. Livi, T. Carletti, G. Innocenti, "Non-normal amplification of stochastic quasicycles" *Phys. Rev. E* **98**, 002200 (2018).
- 16.G. Cencetti, P. Clusella, D. Fanelli, “Pattern invariance for reaction-diffusion systems on complex networks” *Nature Scientific Reports* **8** 16226 (2018).
- 17.G. Cencetti, F. Battiston, D. Fanelli, V. Latora, “Reactive random walkers on complex networks”, *Phys. Rev. E*, **98** 052302 (2018).
- 18.G. Cencetti, F. Bagnoli, G. Battistelli, L. Chisci, D. Fanelli, “Spectral control for ecological stability” *Europ. Phys. J. B* **91** 264 (2018).
- 19.S. Nicoletti, N. Zagli, D. Fanelli, R. Livi, T. Carletti, G. Innocenti, “Non normal amplification of stochastic quasi-cycles” *Phys. Rev E* **98** 032214 (2018).
- 20.F. Di Patti, L. Lavacchi, R. Arbel-Goren, L. Schein-Lubomirsky, D. Fanelli, J. Stavans, “Robust stochastic Turing patterns in the development of a one-dimensional cyanobacterial organism” *Plos Biology* **16**(5): e2004877 (2018).

- 21.M. Lucas, D. Fanelli, T. Carletti, J. Petit, "Desynchronization induced by time varying networks" *Europhys. Lett* **121** 5 (2018).
- 22.D. M. Busiello T. Carletti, D. Fanelli "Homogeneous-per-layer patterns in multiplex networks" *Europhys. Lett.* **121** 4 (2018).
- 23.M. Asllani, T. Carletti, F. Di Patti, D. Fanelli, F. Piazza, "Hopping in the crowd to unveil networks topology" *Phys. Rev. Lett.* **120** 158301 (2018).
- 24.F. Di Patti, D. Fanelli, F. Miele, T. Carletti, "Ginzburg-Landau approximation for self-sustained oscillators weakly coupled on complex directed graphs" *Comm. Non. Sci. and Num Sim.* **56** 447-456 (2018).
- 25.D. Fanelli, F. Ginelli, R. Livi, N. Zagli, C. Zankoc "Noise driven neuromorphic tuned amplifier" *Phys. Rev. E* **96** 062313 (2017). **Selected as Editor's Suggestion.**
- 26.D. Fanelli, T. Carletti, "Quantifying the degree of average contraction of Collatz orbits" *Bollettino dell'Unione Matematica Italiana* (2017).
- 27.J. Petit, B. Lauwens, D. Fanelli, T. Carletti, "Theory of Turing Patterns on Time Varying Networks" *Phys. Rev. Lett.* **119** 148301 (2017).
- 28.G. Cencetti, F. Bagnoli, G. Battistelli, L. Chisci, D. Fanelli "Control of Multidimensional systems on complex networks" *PlosOne* **12**(9): e0184431 (2017).
- 29.C. Zankoc, D. Fanelli, F. Ginelli, R. Livi, "Intertangled stochastic motifs in network of excitatory and inhibitory units" *Phys. Rev E* **96** 022308 (2017).
- 30.C. Zankoc, T Biancalani, D. Fanelli, R. Livi, "Diffusion approximation of the stochastic Cowan-Wilson model", *Chaos, Solitons and Fractals* **103** 504-512 (2017).
- 31.G. Cencetti, F. Bagnoli, G. Battistelli, L. Chisci, F. Di Patti, D. Fanelli, "Topological stabilization for synchronized dynamics on networks" *Europ. Phys. J B* **90** 9 (2017).
- 32.F. Di Patti, D. Fanelli, F. Miele, T. Carletti "Benjamin-Feir instabilities on directed networks" *Chaos, Solitons and Fractals* **96** 8-16 (2017).
- 33.Parras-Rojas, J. D. Challenger, D. Fanelli, A. J. McKane, "Suppressing escape events in maps of the unit interval with demographic noise" *Phys. Rev. E.* **94** 052133 (2016).
- 34.M. Asllani, T. Carletti, D. Fanelli "Tune the topology to create and destroy patterns" *Europ. Phys. J B* **89** 260 (2016).



- 35.F. Di Patti, D. Fanelli, T. Carletti, “Drift induced Benjamin-Feir instability” *Europhys. Lett.* **114** 6 (2016).
- 36.M. Galanti, D. Fanelli, S. Agioletti-Uberti, M. Ballauff, J. Dzubiella, F. Piazza “Reaction rate of a composite macrocell core-shell nanoreactor with encapsulated nano-catalysts” *Physical Chemistry Chemical Physics* **18** 20758-20767 (2016).
- 37.J. Petit, M. Asllani, D. Fanelli, B. Lauwens, T. Carletti, “Pattern formation in a two component reaction-diffusion system with delayed processes on a network” *Physica A* **462** 230-249 (2016).
- 38.G. Cencetti, F Bagnoli, F Di Patti, D Fanelli, “The second will be first: competition on directed networks”, *Nature Scientific Reports* **6** 27116 (2016).
- 39.M. Galanti, S.Traytak, D. Fanelli, F. Piazza “Theory of diffusion influenced reactions in complex geometries” *Physical Chemistry Chemical Physics* **18** 15950-15954 (2016).
- 40.S. Contemori, F. Di Patti, D. Fanelli and F. Miele “Multiple-scale theory of topology-driven patterns on directed networks” *Phys. Rev. E*, **93**, 032317 (2016).
- 41.G. Martelloni, G. Martelloni, P. de Buyl, D. Fanelli “Generalized maximum entropy approach to quasi-stationary states in long range systems” *Phys. Rev. E* **93**, 022107 (2016).
- 42.M. Galanti, D. Fanelli and F. Piazza “Conformation-controlled binding kinetics of antibodies” *Nature Scientific Reports* **6** 18976 (2016).
- 43.J. Petit, T. Carletti, M. Asllani, D. Fanelli, “Delay-induced Turing-like waves for one-species reaction-diffusion model on a network” *Europhys. Lett.* **111** 58002 (2015).
- 44.J. D. Challenger, R. Burioni, D. Fanelli, “Turing-like instabilities from a limit cycle” *Phys. Rev E* **92** 022818 (2015).
- 45.A. Turchi, D. Fanelli, X. Leoncini, “Emergence of a collective crystal in a classical system with long-range interactions”, *Europhys. Lett.* **111** 30011 (2015).
- 46.D. M. Busiello, G. Planchon, M. Asllani, T. Carletti, D. Fanelli, “Pattern formation for reactive species undergoing anisotropic diffusion” *Europ. Phys. J B* **88** 222 (2015).

- 47.M. Asllani, D. M. Busiello, T. Carletti, D. Fanelli, G. Planchon, “Turing instabilities on Cartesian product networks” *Nature Scientific Reports* **5** 12927 (2015).
- 48.F. Di Patti, D. Fanelli, F. Piazza, “Optimal search strategies on complex multi-linked networks” *Nature Scientific Reports* **5** 9869 (2015).
- 49.M. Asllani, D. M. Busiello, T. Carletti, D. Fanelli, G. Planchon, “Turing patterns in multiplex networks” *Phys Rev E* **90** 042814 (2014).
- 50.C. Parra-Rojas, J.D. Challenger, D. Fanelli, A. McKane “Intrinsic noise and two-dimensional maps: Quasicycles, quasiperiodicity, and chaos” *Phys Rev E* **90** 032135 (2014).
- 51.O. Crociani, A. Bechetti, D. Fanelli, A. Arcangeli “Adhesion-Mediated Signalling in Cancer: Recent Advances and Mathematical Modelling” *Biophysical Review and Letters* **9** (03) 285-300 (2014).
- 52.M. Asllani, J. Challenger, F.S. Pavone, L. Sacconi, D. Fanelli “The theory of pattern formation on directed networks” *Nature Communications* **5** 4517 (2014).
- 53.M. Galanti, D. Fanelli, A. Maritan, F. Piazza “Diffusion of tagged particles in a crowded medium” *Europhys. Letters*. **107** (2) 20006 (2014).
- 54.J. D. Challenger, D. Fanelli, A. McKane, “The theory of individual based discrete-time processes” *J. Stat. Phys.* **156**(1) 131-155 (2014).
- 55.Tarcísio N. Teles, Duccio Fanelli, and Stefano Ruffo, “Ensemble inequivalence in systems with wave-particle interaction” *Phys Rev E Rapid* **89** 050101 (2014).
- 56.N. Carlevaro, D. Fanelli, X. Garbet, P. Ghendrih, G. Montani, M. Pettini, “Beam Plasma instability and Fast Particles: the Lynden Bell Approach” *Plasma Physics and Controlled Fusion* **56** 035013 (2014).
- 57.L. Cantini, C. Cianci, D. Fanelli, E. Massi, L. Barletti, M. Asllani “Stochastic Turing patterns for systems with one diffusing species”, *Mathematical Biology* **69** 1585-1608 (2014).
- 58.L. Cantini, C. Cianci, D. Fanelli, E. Massi, L. Barletti “Linear noise approximation for stochastic oscillations of intracellular calcium” *Journal of Theoretical Biology*, **349** 92-99 (2014).

- 59.J. Challenger, D. Fanelli, A. McKane “Intrinsic noise and discrete-time processes” *Phys. Rev. E Rapid* **88** 040102 (2013).
- 60.M. Asllani, T. Biancalani, D. Fanelli, McKane “The linear noise approximation for reaction diffusion systems on a network”, *Europ. Phys. J. B* **86** 476-486 (2013).
- 61.D. Fanelli, A. McKane, B. Tiribilli, G. Pompili, M. Vassalli, T. Biancalani, “Diffusion of two molecular species in a crowded environment: theory and experiments”, *Physical Biology* **10** 045008 (2013).
- 62.C. Cianci, D. Fanelli “Stochastic patterns and the role of crowding” *Discontinuity, Non linearity and Complexity* **2**(4) 301-319 (2013).
- 63.P. De Buyl, G. De Ninno, D. Fanelli, C. Nardini, A. Patelli, F. Piazza, Y.Y. Yamaguchi, “Absence of Thermalization for systems with long range interactions coupled to a thermal bath, *Phys Rev. E* **87** 042110 (2103).
- 64.D. Fanelli, C. Cianci, F. Di Patti, "Multispecies reaction diffusion models and the Turing instability revisited" *Europ. Phys. J B* **86** 142 (2013).
- 65.Marika Masselli, Pasquale Laise, Giulia Tonini, Duccio Fanelli, Serena Pillozzi, Valentina Cetica, Martina Da Ros, Iacopo Sardi, AnnaMaria Buccoliero, Maurizio Aricò, Lorenzo Genitori, Andrea Becchetti and Annarosa Arcangeli, "Deregulation of ion channel and transporter encoding genes in paediatric gliomas", *Frontiers in Pediatric Oncology* **2** 53 (2012).
- 66.M. Asllani, F. Di Patti, D. Fanelli, “Stochastic Turing patterns on a network”, *Phys. Rev. E* **86** 046105 (2012).
- 67.C. Cianci, F. Di Patti, D. Fanelli, L. Barletti, “Analytical study of non Gaussian fluctuations in a stochastic scheme of autocatalytic reactions”, *Europ Phys. Journal Special Topics* **212** 5-22 (2012).
- 68.P. Laise, D. Fanelli, P. Liò, A. Arcangeli, “Modeling TGF-beta; signaling pathway in epithelial-mesenchymal transition” *AIP Advances*, **2** (1) (2012).
- 69.D. Fanelli, G. De Ninno, A. Turchi ”On the paradoxical behavior of a cyclic device working with a non-Boltzmannian fluid” *Communications in Nonlinear Science and Numerical Simulation* **17** (11) 4174-4180 (2012).

- 70.P. De Buyl, D. Fanelli, S. Ruffo, "Phase transitions of quasistationary states in the Hamiltonian Mean Field Model", *Central European Journal of Physics*, **10** (3) 652-659 (2012).
- 71.M. Asllani, D. Fanelli, A. Turchi, T. Carletti, X. Leoncini, "Statistical theory of quasi stationary states beyond the single water-bag case study " *Phys. Rev E* **85** 021148 (2012).
- 72.G. De Ninno, D. Fanelli, "Out of equilibrium statistical ensemble inequivalence" *Europhys. Letters* **97** 20002 (2012).
- 73.P. Laise, D. Fanelli, A. Arcangeli, "A dynamical model of apoptosis and its role in tumor progression", *Comm. in Nonlinear Science. and Num. Sim.* **17** 1795-1804 (2012).
- 74.P. Laise F. Di Patti, D. Fanelli, M. Masselli, A. Arcangeli, "Deterministic and stochastic aspects of VEGF-A production and the cooperative behaviour of tumoral cell colony" *Journal of Theoretical. Biology*, **272**(1) 55-63 (2011).
- 75.C. Cianci, F. Di Patti, D. Fanelli "Non Gaussian fluctuations in stochastic models with absorbing barriers" *Europhys. Letters*, **96** 50011 (2011).
- 76.A. Turchi, D. Fanelli, X. Leoncini, "Existence of Quasi-stationary states at the Long Range threshold" *Comm. in Nonlinear Science. and Num. Sim.* **16** (12) 4718-4724 (2011).
- 77.T. Carletti, D. Fanelli, S. Righi, "Emerging structures in social networks guided by opinions' exchanges", *Advances in complex systems*, **14**(1) 13-30 (2010).
- 78.R. Morris, D. Fanelli, A. McKane, "Dynamical description of vesicles growth and shape change" , *Phys. Rev E* **82** 134123 (2010).
- 79.D. Fanelli, A. McKane, "Diffusion in a crowded environment", *Phys. Rev E* **82** 021113 (2010).
- 80.F. Staniscia, A. Turchi, D. Fanelli, P.H. Chavanis, G. De Ninno, "Negative specific heat in the canonical statistical ensemble", *Phys. Rev. Lett.* **105** 010601 (2010).
- 81.P. de Anna, F. Di Patti, D. Fanelli, A. J. McKane, T. Dauxois, "Spatial model of autocatalytic reactions" *Phys. Rev E* **81** 056110 (2010).

- 82.R Bachelard, T Manos, P de Buyl, F Staniscia, F S Cataliotti, G De Ninno, D Fanelli and N Piovella, “Experimental perspectives for systems based on long-range interactions”, *J. Stat Mech*, P06009 (2010).
- 83.A. Barucci, G. Macaluso, D. Mecatti, L. Noferini, D. Fanelli, A. Facchini, M. Materassi, M. Pieraccini, C. Atzeni “Universal fluctuations in tropospheric radar measurements” *Europhysics Letters*, **89** 20006 (2010).
- 84.F. Di Patti, D. Fanelli, “On the molecular mechanisms driving pain perception and emergent collective behaviors” *Comm. in Nonlinear Science. and Num. Sim.* **15** 1385-1399 (2010).
- 85.T. Biancalani, D. Fanelli, F. Di Patti “Stochastic Turing patterns in the Brusselator model” *Phys. Rev. E* **81** (4) 046215 (2010). **Recommended with a commentary by Mehran Kardar, MIT** ([https://www.condmatjclub.org/uploads/2010/03/jccm\\_march2010\\_011.pdf](https://www.condmatjclub.org/uploads/2010/03/jccm_march2010_011.pdf)).
- 86.T. Van Den Berg, D. Fanelli, X. Leoncini “Stationary states and fractional dynamics in systems with long-range interaction” *Europhysics Letters*, **89** (5) (2010).
- 87.F. Sbrana, D. Fanelli, m. Vassalli, L. Carresi, A. Scala, L. Pazzagli, G. Cappugi, B. Tiribilli “Progressive pearl necklace collapse mechanism for cerato-ulmin aggregation film” *European Biophysics Journal with Biophysics Letters* **39** (6) 971-7 (2010).
- 88.R. Bachelard, D. Fanelli, “Short-time dynamics in presence of wave-particles interactions: a perturbative approach”, *Comm. in Nonlinear Science. and Num. Sim.* **15** 1 40-47 (2010).
- 89.F. Di Patti, D. Fanelli, “Can a microscopic stochastic model explain the emergence of pain cycles in patients?” *J. Stat. Mech.: Theory and Exp.* **1** P01004 (2009).
- 90.F. Di Patti, D. Fanelli, “A stochastic reaction scheme for drug/metabolite interaction” *Journal of Theoretical Biology* **259** 382-388 (2009).
- 91.R. Bachelard, C. Chandre, A. Ciani, D. Fanelli, Y. Yamaguchi, “Analytical results on the magnetization of the Hamiltonian Mean Field model”, *Physics Letters A.* **373** 46 (2009) 4239.

- 92.F. Staniscia, P.H. Chavanis, G. De Ninno, D. Fanelli, “Out-of-equilibrium phase re-entrance(s) in long-range interacting systems” *Phys. Rev. E* **80** 021138 (2009).
- 93.D. Fanelli D., A. McKane, Reply to “Comment on ‘Thermodynamics of vesicle growth and instability’ ” *Phys. Rev. E* **80** 1539-3755 (2009).
- 94.J. Barrè, A. Ciani, D. Fanelli, F. Bagnoli, S. Ruffo, “Finite size effects for the Ising model on random graphs with varying dilution” *Physica A* **388** 3413-3425 (2009).
- 95.P. De Buyl, D. Fanelli, R. Bachelard, G. De Ninno, “Out-of-equilibrium mean-field dynamics of a model for wave-particle interaction” *Phys. Rev. S T- Accel . Beams* **12**, 6 (2009).
- 96.X. Leoncini, T. L. Van Den Berg and D. Fanelli, “Out-of- equilibrium solutions in the XY-Hamiltonian Mean-Field model” *Europhysics Letters*, **86** 20002 (2009).
- 97.T. Dauxois, F. Di Patti, D. Fanelli, A. J. McKane, “Enhanced Stochastic oscillations in autocatalytic reactions” *Phys. Rev. E* **79** 036112 (2009).
- 98.D. Fanelli, A. J. McKane, “Thermodynamics of vesicle growth and instability” *Phys. Rev. E* **78** 051406 (2008).
- 99.R. Bachelard, C. Chandre, D. Fanelli, X. Leoncini and S. Ruffo “Abundance of Regular Orbits and Nonequilibrium phase transitions in the Thermodynamic limit of Long-Range Systems” *Phys. Rev. Lett.* **101** 260603 (2008).
- 100.F. Di Patti, D. Fanelli, R. Pedersen, C. Giuliani, F. Torricelli, “Modelling the Pharmacokinetics of Tramadol: On the difference between extensive and poor metabolizers” *J. of Theoretical Biology* **254** 3 568 (2008).
- 101.T. Carletti, D. Fanelli, A. Guarino, F. Bagnoli, A. Guazzini, “Birth and death in a continuous opinion dynamics model – The consensus case”, *Europ. Phys. J. B.* **64** 2 285-292 (2008).
- 102.R. Bachelard, C. Chandre, D. Fanelli, X. Leoncini, “Stabilizing the intensity for an Hamiltonian model of FEL”, *Nuclear Methods and Instruments in Physics Research: Section A*, **593**, 94 (2008).

- 103.D. Fanelli, O. Öktem, "Electron Tomography: A short overview with an emphasis on the absorption potential model for the forward problem", *Inverse problems* **24** 013001(51pp) (2008). Topical Review.
- 104.F. Bagnoli, T. Carletti, D. Fanelli, A. Guarino, A. Guazzini, "Modelling the role of affinity in opinion dynamics" *Phys. Rev. E.* **76** 066105 (2008).
- 105.A. Antoniazzi, D. Fanelli, R. Johal, S. Ruffo, "On the origin of quasi stationary states in a model of wave-particles interactions" *Comm. in Nonlinear Science. and Num. Sim.* **13** 2 (2008).
- 106.R. Bachelard, A. Antoniazzi, C. Chandre, D. Fanelli, M. Vittot "Enhancement of particle trapping in the wave-particle interaction", *Comm. in Nonlinear Science. and Num. Sim.*, **13** 660-665 (2008).
- 107.F. Curbis, A. Antoniazzi, G. De Ninno, D. Fanelli "Maximum entropy principle and coherent harmonic generation using a single pass free electron laser: A recipe to predict the saturated intensity", *Europ. Phys. J. B* **59**, 527-533 (2007).
- 108.A. Antoniazzi, D. Fanelli, S. Ruffo, Y. Yamaguchi, "Non equilibrium tricritical point in a system with long-range interactions", *Phys. Rev. Lett.* **99** 040601 (2007).
- 109.L. Bongini, D. Fanelli, F. Piazza, P. De Los Rios, S. Sandin, M. Sanner, U. Skoglund, "A dynamical Study of antibody-antigen encounter process" *Physical Biology*, **4** 172-180 (2007).
- 110.L. Bongini, D. Fanelli, S. Svensson, M. Gedda, F. Piazza, U. Skoglund, "Resolving the geometry of biomolecules as seen by Cryo-Electron Tomography", *Journal of Microscopy* **228** 174-184 (2007).
- 111.F. Sbrana, L. Bongini, L. Cappugi, D. Fanelli, A. Guarino, L. Pazzagli, A. Scala, M. Vassalli, C. Zoppi, B. Tiribilli "Atomic force microscopy images suggest aggregation mechanisms in cerato-platanin" *European Biophysical Journal* **36** 7 (2007).
- 112.A. Antoniazzi, F. Califano, D. Fanelli, S. Ruffo, "Exploring the thermodynamic limit of Hamiltonian models: convergence to the Vlasov equation" *Phys. Rev. Lett.* **98** 150602 (2007).

- 113.A. Antoniazzi, D. Fanelli, J. Barrè, P.H. Chavanis, T. Dauxois, S. Ruffo “A maximum entropy principle explains quasi-stationary states in system with long-range interactions” *Phys. Rev E* **75** 011112 (2007).
- 114.T. Carletti, D. Fanelli, “From chemical equation to evolution: emergence of species” *Europhys. Letters* **77** 18005 (2007).
- 115.R. Bachelard, A. Antoniazzi, C. Chandre, D. Fanelli, X. Leoncini, M. Vittot “Stabilizing the intensity of a wave amplified by a beam of particles”, *European Physical Journal B* **42** 207 (2007).
- 116.S. Svensson, M. Gedda, D. Fanelli, U. Skoglund, S. Sandin, L.G. Öfverstedt “Using a fuzzy framework for delineation and decomposition of Immunoglobulin G in cryo electron tomographic images” *ICPR’06, IEEE* (2006).
- 117.A. Antoniazzi, D. Fanelli, Y. Elskens, S. Ruffo “Statistical mechanics and Vlasov equation allow for a simplified Hamiltonian description of Single Pass Free Electron Laser dynamics”, *European Physical Journal B*, **50** 603-611 (2006) .
- 118.T. Carletti, D. Fanelli, A. Guarino, “How to make an efficient Propaganda”, *Europhys. Lett.* **74**(2) 222-228 (2006).
- 119.T. Carletti, D. Fanelli, A. Guarino, “A simple model for gait time series in neurodegenerative disease”, *Neuroscience Letters*, **394** 3 252-255 (2006).
- 120.G. De Ninno, A. Antoniazzi, B. Diviacco, D. Fanelli, L. Giannessi, R. Meucci, M. Trovò “Stabilization of the Elettra storage-ring free-electron laser using a closed-loop derivative feedback”, *Phys. Rev E*. **71**, 066504 (2005).
- 121.F. Piazza, P. De Los Rios, L. Bongini, D. Fanelli "Anticooperativity in diffusion controlled reactions with pairs of partially absorbing spheres: a model for the antigen-antibody encounter", *European Biophysics Journal*, **34** 7 899-911 (2005).
- 122.A. Antoniazzi, G. De Ninno, A. Guarino, D. Fanelli, S. Ruffo “Wave-particles interactions: from plasma physics to free electron laser dynamics”, *Journal of Physics: Conference Series*, **7** 143-153 (2005).



- 123.L. Bongini, D. Fanelli, F. Piazza, P. De Los Rios, S. Sandin, U. Skoglund, "Dynamics of antibodies from cryo-electron tomography", *Biophysical Chemistry*, **115** 235-240 (2005).
- 124.G. De Ninno, D. Fanelli, "A fully analytical approach to the longitudinal dynamics of a storage-ring free-electron laser", *Phys. Rev. E*, **70** 016503 (2004).
- 125.L. Bongini, D. Fanelli, F. Piazza, P. De Los Rios, S. Sandin, U. Skoglund, "Freezing immunoglobulins to see them move", *Proc. Natl. Acad. Sci. USA*, **101** 17 6466-6471 (2004).
- 126.J. Barre', T. Dauxois, G. De Ninno, D. Fanelli, S. Ruffo, "Statistical theory of high-gain free-electron laser saturation", *Phys. Rev. E, Rapid Communication*, **69**, 045501 (2004).
- 127.G. De Ninno, D. Fanelli, "A deeper analytical insight into the longitudinal dynamics of a storage-ring free-electron laser", *Nucl. Instrum. and Methods in Physics Research A* **528** 1-2, 39-43 (2004).
- 128.G. De Ninno, D. Fanelli, "Controlled Hopf Bifurcation of a Storage Ring Free-Electron Laser", *Phys. Rev. Lett.* **92**, 094801 (2004).
- 129.E. Aurell, D. Fanelli, S.N. Gurbatov, A. Moshkov, "The inner structure of Zeldovich' pancakes", *Physica D* **186**, 171-184 (2003).
- 130.A. Noullez, D. Fanelli, E. Aurell, "A heap-based algorithm for the study of one-dimensional particles system", *Journ. of Comp. Phys.* **186**, 697-703 (2003).
- 131.G. De Ninno, D. Fanelli, C. Bruni, M.E. Couprie, "Chaotic dynamics in a Storage Ring Free Electron Laser", *Europ. Phys. Journ. D* **22**, 269-277 (2003).
- 132.D. Fanelli, E. Aurell, "Asymptotic behaviour of a stratified perturbation in a three dimensional expanding Universe", *Astron. & Astrophys.* **395**, 399-408 (2002).
- 133.G. De Ninno, D. Fanelli, M.E. Couprie, "Detuned Dynamics of a Storage-Ring Free-Electron Laser", *Nucl. Instrum. and Methods in Physics Research A*, **483**, 177 (2002).
- 134.D. Fanelli, S. Ruffo, "Self-gravitating shells systems and globular clusters", *Physica A* **305** 253 (2002).

- 135.D. Fanelli, M. Merafina, S. Ruffo, "A one dimensional toy model of globular clusters" , *Phys. Rev. E* **63** 066614 (2001).
- 136.E. Aurell, D. Fanelli, P. Muratore-Ginanneschi, "On the dynamics of a self-gravitating medium with random and non-random initial conditions", *Physica D*, **148** 272-288 (2001).
- 137.G. De Ninno, D. Fanelli, "Resonances families and their action on betatron motion", *Phys. Rev. ST-Accel. Beams* **3**, 054001 (2000).

### **Other Journals and Refereed Proceedings**

- 138.G. de Vito et al. "Two-photon light-sheet microscopy for high-speed whole-brain functional imaging of zebrafish neuronal physiology and pathology" *Neurophotonics* 11360, 1136004 (2020).
139. G. de Vito et al. "Two-photon light-sheet microscopy for high-speed whole-brain functional imaging of zebrafish neuronal physiology and pathology" *Neurophotonics* 11360, 1136004 (2020).
- 140.D. Fanelli, "Collective and microscopic dynamics in mean field Hamiltonian models", Proceedings of the the *12th Marcel Grossman Meeting*, Paris (2010).
- 141.R. Bachelard, M.-E. Couprie, P. de Buyl, G. De Ninno, D. Fanelli, S. Ruffo, C. Chandre, X. Leoncini, "Deep saturation dynamics in a Free Electron Laser", Proceedings of the 29<sup>th</sup> International Free Electron Laser Conference, Liverpool, UK (2009).
- 142.R. Bachelard, C. Chandre, M.-E. Couprie, D. Fanelli, X. Leoncini, S. Ruffo, "Orbites regulieres et transition de phases hors-d'equilibre dans les systemes avec interactions a longue portee", *Compte-rendus de la 12e Rencontre du Non-Lineaire*, edited by C. Josserand, M. Lefranc and C. Letellier (Non Lineaire Publications, 2009).

- 143.P. De Buyl, R. Bachelard, M.-E. Couprie, G. De Ninno, D. Fanelli, "Transition de phases hors-d'equilibre dans le Laser a Electrons Libres", *Compte-rendus de la 12e Rencontre du Non-Lineaire*, edited by C. Josserand, M. Lefranc and C. Letellier (Non Lineaire Publications, 2009).
- 144.A. Antoniazzi, D. Fanelli, S. Ruffo, "The HMF model: anomalous or normal diffusion?" *AIP conf Proceedings, CTNEXT07, Catania, Stathys23 Satellite* (2008).
- 145.R. Bachelard, C. Chandre, A. Antoniazzi, D. Fanelli and G. De Ninno, "Control of the Intensity of a Wave Interacting with Charged Particle", *Proceedings of the 28<sup>th</sup> International Free Electron Laser Conference* (2008).
- 146.T. Carletti, D. Fanelli, A. Guarino, A. Guazzini, "Meet discuss and Trust each other: large versus small groups" in *WIWACE 2008* (2008).
- 147.P.H. Chavanis, G. De Ninno, D. Fanelli, S. Ruffo, "Out of equilibrium phase transitions in Mean Field Hamiltonian dynamics", *World Scientific Conf. Proceedings, and Chaos and Transport*, X. Leoncini et al. (Eds.) (2008).
- 148.R. Bachelard, A. Antoniazzi, C. Chandre, D. Fanelli, M. Vittot "Enhancement of particle trapping in the free electron laser", *proceedings of Chaos06*, Reims (Elsevier) (2006).
- 149.R. Bachelard, C. Chandre, X. Leoncini, M. Vittot, A. Antoniazzi, D. Fanelli "Control of the Intensity of a Wave Interacting with Charged Particles", *Proceedings of the 28<sup>th</sup> international FEL conference 2006* (2006).
- 150.A. Antoniazzi, J. Barrè, T. Dauxois, G. De Ninno, D. Fanelli, . Ruffo, "Free Electron Laser as a paradigmatic model example of systems with long-range interactions", *Proceedings of the 28<sup>th</sup> international FEL conference 2006* (2006).
- 151.F. Curbis, A. Antoniazzi, G. De Ninno D. Fanelli, "The saturated regime of a seeded single pass Free Electron Laser", *Proceedings of the 28<sup>th</sup> international FEL conference 2006* (2006).
- 152.E. Allaria, G. De Ninno, A. Antoniazzi, D. Fanelli, "Dynamics Control of the Elettra Storage Ring Free-Electron Laser with Digital Feedbacks", *Proceedings of the 28<sup>th</sup> international FEL conference 2006* (2006).

- 153.R. Bachelard, C. Chandre, X. Leoncini, M.Vittot, A.Antoniazzi, D. Fanelli, Contrôler l'interaction onde-particules, Rencontres du Non-Linéaire, Paris (2006).
- 154.L. Sguanci, F. Bagnoli, D. Fanelli "A cellular automata model for ripple formation" *Proceedings of the 7<sup>th</sup> International Conference on Cellular Automata for Research and Industry ACRI2006*, Lecture Notes in Computer Science LNCS 4773, Springer, Berlin (2006) 407-416.
- 155.T. Carletti, D. Fanelli, "Evolution of a population of protocells: emergence of species" *Proceedings of BIOMAT2006 International Symposium* (2006).
- 156.E. Allaria, A. Antoniazzi, G. De Ninno, D. Fanelli, R. Meucci, F.T. Arecchi, "Stabilization of the Elettra storage ring free electron laser through a delayed feedback control method" *Proceedings of the 27<sup>th</sup> international FEL conference 2005*, (2005).
- 157.S. Bielawski, C. Szwaj, C. Bruni, D. Garzella, G-L. Orlandi, M.E. Couprie, M. Hosaka, Amochihashi, Y. Takashima, M. Katoh, G. De Ninno, M. Trovò , B. Diviacco, D. Fanelli, "Feedback Control of Dynamical Instabilities in Classical Lasers and FELs" *Proceedings of the 27<sup>th</sup> international FEL conference 2005*, (2005).
- 158.E. Aurell, D. Fanelli, S.N. Gurbatov, A. Moshkov, "The non-linear regime of the gravitational instability. The inner structure of the pancake", *Frontier of Nonlinear Physics* (2005).
- 159.C. Bruni, M.E. Couprie, D. Garzella, G.L. Orlandi, L. Giannessi, E. Allaria, R. Meucci, D. Fanelli, S. Bielawski, M. Danailov, G. De Ninno, B. Diviacco, M. Trovo', "Stabilization of the pulsed regimes on a Storage Ring Free Electron Laser: The cases of Super-ACO and ELETTRA" , *EPAC 2004* (2004).
- 160.M.E. Couprie, G. De Ninno, D. Fanelli, D. Garzella , "Etudes théoriques de chaos sur le Laser à Electrons libres de Super-ACO", *Comptes-Rendus de la 5<sup>e</sup> Rencontre du Non-Linéaire*, Paris, 61-66 (2002).
- 161.D. Fanelli, E. Aurell, A. Noullez, "Heap-based scheme and 1D expanding Universe", *proceeding of IAU Symposium 208* (Tokyo) (2001).

- 162.D. Fanelli, M. Merafina, S. Ruffo, "1-D toy model of globular cluster formation", proceedings of the *Ninth Marcel Grossman Meeting*, Rome (2001).
- 163.E. Aurell, D. Fanelli, "Self-gravitating systems in a three-dimensional expanding Universe", cond-mat/0106444 (2001).
- 164.G. De Ninno, D. Fanelli, "Multiple resonance treatment for linear coupling", *EPAC 2000*, Wien (2000).
- 165.E. Aurell, D. Fanelli, P. Muratore-Ginanneschi, "Self-gravitating systems and expanding Universe ", proceeding of "Rencontre de Blois: the birth of galaxies", Blois, France (1998).
- 166.D. Guyomarc'h, F. Doveil, Y. Elskens, D. Fanelli, "Warm beam-plasma instability beyond saturation", *Transport, Chaos and Plasma Physics 2*, S. Benkadda, F. Doveil, Y. Elskens eds. (World Scientific) (1997).
- 167.D. Guyomarc'h, F. Doveil, Y. Elskens, D. Fanelli, "Long time evolution of a warm beam plasma instability", *Bull. Am. Phys. Soc. (ser. II)* 41 (1997) 1493.

### **Technical and Internal Reports**

- 151.T. Carletti, D. Fanelli, "Emergence of species in a Chemoton-like model: Technical issues", [www.fundp.ac.be/publications/58350.pdf](http://www.fundp.ac.be/publications/58350.pdf) (2006).
- 152.D. Fanelli, O. Öktem , "A suggestion for an experimental test of the validity of the standard model in ET" *Technical report*, Sidec Technologies AB, Torshamnsgatan 28A, SE-164 40 Kista, Sweden, (2005).
- 153.G. De Ninno, D. Fanelli , "A full analytical insight into the longitudinal dynamics of a Storage Ring Free-Electron Laser ", Elettra Technical Report ST/SL-03/03, Trieste, Italy (2003).
- 154.D. Fanelli, S. Masich, "The alignment of Electron Tomography Images", Technical Report, Sidec Technologies AB, Torshamnsgatan 28A, SE-164 40 Kista, Sweden (2003).

155.A. Noullez, D. Fanelli, E. Aurell, "A heap-based algorithm for the study of 1D particles system", TRITA-NA-0208, NADA, KTH (extended version) (2002).

156.D. Fanelli, "Clustering in a two-masses self-gravitating system in an expanding medium", TRITA-NA-0209, NADA, KTH (2002).

### **Chapters of Books**

157.A. Antoniazzi, G. De Ninno, D. Fanelli, "Stabilization of the temporal dynamics of a storage-ring free-electron laser" , *"Focus on Laser and Electro- Optics Research II"*, Nova Science Publisher Inc. (2005).

158.A. Ciani, D. Fanelli, S. Ruffo, "Long-range interactions and diluted networks", *Long-range Interactions, Stochasticity and Fractional Dynamics*, HEP and Springer,(2010).

159.D. Fanelli, "Temporal and spatial ordering beyond the deterministic limit: the role of stochastic fluctuations in population dynamics", Book Chapter in "From Hamiltonian Chaos to Complex Systems", Springer (2012).

### **Miscellanea**

160. D. Fanelli, V. Fiorentini, S. Ruffo, G. Ciccotti, G. Parisi "Balance Research Funds across Europe" *Nature* **530** 33 (2016) (see <https://media.nature.com/original/nature-assets/nature/journal/v530/n7588/extref/530033d-s1.pdf>).

161. D. Fanelli, R. Livi "Aggiornamento sullo stato della ricerca in Fisica in Italia" in A. Baracca "Storia della Fisica italiana - Un'introduzione" Jaca book (2017).

### **Books**

1) M. Bruzzi, F.S. Cataliotti, D. Fanelli *"Elementi di Meccanica e Termodinamica"* Esculapio (First Edition 2013 / Second Edition 2017).

2) A. Campa, T. Dauxois, D. Fanelli, S. Ruffo, “*The Physics of Long Range Systems*”, Oxford University Press (2014) .

3) M. Bruzzi, F. S. Cataliotti, D. Fanelli, M. Siciliani De Cumis, “*Esercizi di Meccanica*” Esculapio (First Edition 2015 / Second Edition 2018)

