

## HOME

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## WORK

Centre de Biophysique Moléculaire (CBM) Rue Charles Sadron, 45071, Orléans, France Tel. +33 (0)2 38 25 56 53 GSM +33 (0)6 37 99 38 58 Email: <u>Francesco.Piazza@cnrs-orleans.fr</u> **Web: http://dirac.cnrs-orleans.fr/~piazza/PB/** 

#### PROFESSIONAL RECORD

January 2016	Invited professor, University of Florence, Physics Department
2010 - present	<ul> <li>Full professor of condensed-matter and theoretical physics</li> <li>Professeur II-ème classe, 28-ème section (physique de la matière condensée)</li> <li>University of Orléans, France</li> <li>Team leader, Statistical Physics of Living systems and Nano-biotechnology group (2016 - present),</li> <li>Co-director, Theoretical Biophysics group (2016 - present)</li> <li>Centre de Biophysique Molécuaire (CBM), Orléans</li> </ul>
2010	Guest scientist, Institute for the study of complex systems (CSDC), University of Florence, Italy Research associate, Computer Laboratory, University of Cambridge, U.K. Guest scientist, Ecole Polytechnique Fédérale de Lausanne (EPFL), SB-ITP-LBS, Group of Statistical Biophysics.
2003 - 2009	Research and teaching associate. Ecole Polytechnique Fédérale de Lausanne (EPFL), SB-ITP-LBS, Group of Statistical Biophysics.
2006	CNRS visiting scientist (chercheur associé), Ecole Normale Superieure de Lyon, France (3 months).
2006	Swiss National Foundation (SNF) visiting scientist, JNU, New Delhi, India (one month).
2001-2003	INFM fellow. Dipartimento di Fisica, Università di Firenze, Italy. FORUM project "Study of statistical and dynamical models of biomolecules" (STADYBIS).
2001-2002	Assistant professor at the University of Florence, Faculty of Engineering
AWARDS	

• 2017. France Ministry of National Education prize for research and doctoral training (PEDR).

#### 2 Francesco Piazza's CV

#### **EDUCATION**

- November 2002. Ph.D. in Physics. Heriot-Watt University, Edinburgh, U.K.
- July 1996. Degree (laurea) in Physics, Università di Firenze, Italy.
- July 1989. Diploma, Classical Lyceum "Dante Alighieri", Florence.

## SECURED FUNDING

- 1/12/2018 Physical and computational aided design of bispecific antibodies for cancer immunotherapy (ComPhysAb), INSERM Physics of cancer. Principal investigator of the Orléans node (140 kEUR).
- 2018 PIA2 (Programme Investissements d'Avenir, French Ministry of Education). Project BIOS in collaboration with the University of Tours, INRA Nouzilly and the SERVIER laboratory. 130 kEUR, Principal investigator of the CBM node.
- 2016, Cosmetoscience project (<u>http://cosmetosciences.org/</u>) "Use of a class of trehalose and its homologues and polyols in innovative cosmetic formulations and technologies", 47 kEUR (1 postdoc) + 18 kEUR (consumables and equipment). Principal investigator.
- 2014, Le <u>STUDIUM project "CeLL-oid biology</u>: exporting concepts and methods from the physics of colloids to study biomolecular interactions mid-way between the test-tube and the cell", funding for a one-year senior collaborator. Approx. 60 kEUR, principal investigator.
- 2014-2017. <u>Role of classical and quantum vibrations in the dynamics of biological</u> <u>macromolecules</u>, Programme d'Actions Universitaires integrées Luso-Françaises (PAUILF 2013-2014), Conférence des Présidents d'universités (CPU) et Ministère des Affaires Etrangères et Ministère de l'Enseignement Supérieur et de la recherche. Mobility funds for a joint project with Instituto de Telecomunicações (IT), Lisbon, Portugal (1.5 kEUR/year over three years).
- 2014-2017. <u>Theoretical models of diffusion in crowded and confining environments: applications</u> to intra-cellular transport, call Projets internationaux de coopération scientifique (PICS), funded by the Centre National de la Recherche Scientifique (CNRS) in the framework of a collaboration with the University of Florence, Italy. 7 kEUR/year.
- 2013-2016. Phonon-Assisted Processes for Energy Transfer and Sensing (PAPETS), STREP, EU call ICT FET open call FP7-ICT-2011-C. Budget: 242 kEUR: Task leader of the French node. http://www.quantumbiology.eu
- 2012, Le <u>STUDIUM project</u> "Crowding Effects in Diffusion-limited Processes in Chemistry and Biology: Theoretical Physics Approaches", funding for a one-year senior collaborator. Approx. 60 kEUR, principal investigator.
- May 2011: <u>Swiss National Science Foundation (SNF) short visiting grant</u>. Project "Physics of diffusion-limited reactions in crowded media", to be carried out at EPFL, Switzerland. Size: 3.4 kCHF, Principal investigator.
- September-December/2006. <u>CNRS chercheur associé (invited professor)</u>, Laboratoire Joliot-Curie, Ecole Normale Superieure de Lyon. Size: 6,0 kEUR (P.I.)
- September 2005: <u>Swiss National Science Foundation (SNF) short visiting grant</u>. Project "Experimental and theoretical study of energy relaxation in nano-scale materials", to be carried out at JNU, New Delhi, India. Size: 5.2 kCHF, Principal investigator.
- 2001-2003: <u>INFM grant</u> within the project "Statistical and dynamical properties of bio-molecular structures (STADYBIS)": Size: 15 kEUR/year, co-investigator.
- 1997–2001: <u>Heriot-Watt Ph.D. Scholarship</u>, HW University, UK. Project title "Nonlinear dynamics of high-T<sub>c</sub> superconductors". Size: 6000 pounds/year (maintenance) + tuition fees.

# SCIENTIFIC COLLABORATIONS

• Dr Yann Chalopin, Laboratoire d'Énergétique Moléculaire et Macroscopique, Combustion (EM2C) - UPR288, Centrale Supélec, Gif-sur-Yvette

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- Prof. Michael Rangunath, Zurich University of Applied Sciences.
- Prof. Chantal Pichon, Dr P.atrick Midoux, CBM, Orleans, France
- Prof. Alberto Imparato, University of Aarhus, Denmark.
- Dr Yves-Henri Sanejouand, Laboratoire Biotechnologie, Biocatalyse et Biorégulation, Université de Nantes, France.
- Prof. Roberto Livi, Dipartimento di Fisica, Università di Firenze, Italy.
- Prof. Duccio Fanelli, Dipartimento di fisica, Università di Firenze, Italy.
- Prof. G. De Ninno, University of Nova Gorica, Slovenia and Elettra, Sincrotrone Trieste.
- Dr Stefano Lepri, Institute for Complex Systems, ISC-CNR, Florence, Italy.
- Dr Daniele Colognesi, Institute for Complex Systems, ISC-CNR, Florence, Italy.
- Prof. Anand Yethiraj, Memorial University of Newfoundland, St John's, Canada.
- Prof. John Dutcher, Guelph University, Ontario, Canada.
- Prof. Paolo De Los Rios, Institute of theoretical physics, EPFL, Lausanne, Switzerland.
- Prof. Giuseppe Foffi, Institute of theoretical physics, EPFL, Lausanne, Switzerland and Laboratoire de Physique des Solides, University of Paris sud, Orsay, Franc

## OTHER RECENT SCIENTIFIC AND ADMINISTRATIVE ACTIVITIES

• I am a member of the editorial board of the peer-reviewed journal "Scientific Reports", Nature publishing group (NPG).

Editorial Board Member for Scientific Reports

- I participate to the EU-COST action "ARBRE MOBIEU: BETWEEN ATOM AND CELL" Web site: <u>https://arbre-mobieu.eu</u>
- I have served as topic editor for the **Frontiers in Physics** (biophysics section) research topic *"Macromolecular crowding in the cell: current state of the art, challenges and future perspectives"* (https://www.frontiersin.org/research-topics/2550/macromolecular-crowding-in-the-cell-current-state-of-the-art-challenges-and-future-perspectives ).
- I have co-organized the International Conference "Recent advances in basic and applied science in cosmetics", held from July 3<sup>rd</sup> to July 5<sup>th</sup> in Tours, France.
   Web site: <a href="http://www.lestudium-ias.com/fr/event/recent-advances-basic-and-applied-science-cosmetics">http://www.lestudium-ias.com/fr/event/recent-advances-basic-and-applied-science-cosmetics</a>
- I have co-organized the third edition of the series of international conferences "Reaction Kinetics in Soft and Condensed Matter" (RKSCM 2014), held from 1<sup>st</sup> to 4<sup>th</sup> july 2014 at the Hotel Dupanloup (International Centre for Research of the University of Orléans), Orléans, France. Web site: <u>http://dirac.cnrs-orleans.fr/~piazza/RKCM2014/</u>
- I have co-organized the international workshop "Macromolecular crowding effects in cell biology: models and experiments", held from 24<sup>th</sup> to 25<sup>th</sup> October 2013, CNRS campus, Orléans, France.

Web site: http://dirac.cnrs-orleans.fr/~piazza/

- I have co-organized the international conference "Macromolecular crowding: chemistry and physics meet biology", held from 10<sup>th</sup> to 14<sup>th</sup> june 2012 at the Centro S. Franscini, Monte Verità, Ascona, Switzerland. Web site: <u>http://crowding2012.epfl.ch</u>
- I served as guest editor for a special (focus) issue of the IOP journal Physical Biology devoted to the conference Molecular Crowding 2012. Web site:<u>http://iopscience.iop.org/1478-3975/10/4</u> www.datasets.com/journals/physics
- Referer for Physical Biology, Journal of Physical Chemistry, different journals of the Physical Review family, Journal of Physics C Condensd Matter and other journals of the IOP (Institute of Physics, UK) family and others (Elsevier, Oxford, Taylor & Francis and others).
- I have many administrative incumbencies, such as participate to jurys de these (Ph.D. committees) and recruitment committees for academic positions, both at my university and other French universities.

## SUPERVISION (a.y. = academic year)

## Postdoc

4/2018 – 10/2020. Suman Saurabh, Project PIA2 BIOS

11/2016 - 11/2017. Claire Madeleine Perdrillat, Project Cosmetoscience 2016

2/2014 – 12/2016. <u>Stefano Iubini</u>, Project PAPETS (Eu STREP)

# Ph.D.

4/2018 – 4/2019 (abandoned). <u>Oliver Becerra</u>. Mixed quantum classical coarse-grained models of enzyme kinetics and transport in proteins (funded by CONACYT, Mexico). Oliver renounced to his grant to get a job in the USA in the field of data science.

10/2016- 08/2018 (abandoned). <u>Ariel Ayala</u>. Role of fluctuations in biochemical reactions in complex confining media: a statistical physics approach (funded by CONACYT, Mexico). Ariel quit his thesis project midway as he realized that academic research is not what he wants to do. 9/2014 – present. Sima Pooyandeh. Role of classical and quantum vibrations in the dynamics of biomolecules . (funded by Doctoral Programme in the Physics and Mathematics of Information, IST, University of Lisbon), International joint Ph.D. (co-supervised with Prof. Y. Omar), Instituto de Telecomunicações (IT), Lisbon.

9/2013 – 1/2017. <u>Simon Aubailly</u>. Mechanisms of allosteric communication in proteins: insight from theoretical physics coarse-grained models and nonlinear dynamics methods (funded by French ministry of research).

11/2012 – 2/2016. <u>Marta Galanti.</u> Mathematical methods for diffusion in crowded environments", International joint Ph.D. (co-supervised with Prof. D. Fanelli), Department of physics, University of Florence (funded by regione Toscana).

# Master and Bachelor, University of Orléans (UO). $M(1,2) = (1^{st}, 2^{nd})$ year master thesis

A.y. 2018/2019. <u>Mohamed Aouane</u>. Non-equilibrium effects in enhanced diffusion of enzymes and enzyme-functionalized particles: theory and experiments. Master Physique Fondamentale et applications (UO PhyFA), **M2**. <u>Thibault Fillion</u>. Modelling cooperative effects in non-specific adsorption of proteins on nano and microbeads. Master of Life sciences UO. **M1**. A.y. 2017/2018. <u>Marin Matic</u>. Crowding effects in enzyme kinetics: experiments and theory (joint supervision with Prof. J. Hamacek, CBM). **M2**.

A.y. 2016/2017. <u>Robin Beer</u>. Diffusion of tracer molecules in complex polymer melts. A coarsegrained molecular dynamics study, 1st year stage, Master "Energie et matériaux", University of Orléans. **M1**. <u>Mouad Essani</u>. Nonlinear localized modes in NaI and LiI crystals at high temperature: a coupled MD-wavelet investigation. Master "Energie et matériaux", University of Orléans. **M1**. <u>Annise Riviere</u>. Nonlinear localized modes in alkali-halides at high temperature: a coupled MDwavelet investigation. 3rd year stage, Licence de physique, University of Orléans.

A.y. 2014/2015. <u>Thiago Puccinelli</u>. Diffusion of a tracer particle in the presence of fixed obstacles of different size. 1st year stage, Master "Energie et matériaux", University of Orléans. **M1**. A.y. 2012/2013. <u>Tiburce Daouda Ndoung</u>. The problem of the thrown string: theory and experiments. Master "Energie et matériaux", University of Orléans. **M1**. <u>Marwan Bouchareb</u>. Nonlinear dynamics of NaI crystals, a molecular dynamics study, 3rd year stage, Licence de physique, University of Orléans.

A.y. 2011/2012. <u>David Richard</u>. Molecular dynamics simulations of a Lennard-Jones fluid. 3rd year stage, Licence de physique, University of Orléans.

A.y. 2010/2011. <u>Homam Shahhod</u>. Characterization of adamantane/DNA nanoparticles: a combined experimental and theoretical study". Master 2 in Biotechnology, University of Orléans. Funded by CBM. **M2**.

**Master 2 in physics, EPFL:** <u>Samuel Urfer</u>, "Spreading of a point-like perturbation in a nonlinear chain with disorder" (2009), <u>Marc Weber</u>, "Thermal energy relaxation in non-linear chains" (2007).

**Travaux Pratiques 4th year, EPFL**: <u>Cristophe Paturle</u>, "Non-equilibrium phase transitions in the Hamiltonian mean-field model with disorder" (2009), <u>Samuel Urfer</u>, "Nonlinear dynamics of proteins" (2008), <u>Samuel Urfer</u>, "Discrete breathers in proteins" (2007), <u>Sebastian Weber</u>,

"Energy relaxation in a 1D FPU chain in contact with a thermal bath" (2005).

## TEACHING

All teaching material is available for download at (clickable): http://dirac.cnrs-orleans.fr/~piazza/PB/teaching.html

#### Selected topics in biological physics (Ph.D. course)

This course is intended to present some recent advances in physical biology, covering mainly two topics, (i) coarse-grained models of protein dynamics and (ii) diffusion-limited bimolecular reactions with an emphasis on diffusion in crowded and confined environments. The course is open to all Ph.D. students in the scientific doctoral schools. A background in elementary statistical mechanics and calculus is required but no pre-requisite in molecular and cell biology is needed, as a basic introduction to this is provided. The most complex mathematical derivations are done in full length and at slow pace, covering all details in a self-contained manner. The course is structured in about 8 courses of 2 hours, two of which can be organized as exercise classes, with the possibility of both supervised problem solving and running individual or group sessions of computer simulations and calculations, covering aspects treated during the lectures. The material for these (computer codes etc.) are supplied by the instructor. Students have the possibility to set up their personal laptops to use them for the exercise classes.

Lectures notes available at (clickable): http://dirac.cnrs-orleans.fr/~piazza/PB/teaching.html

University of Orléans (Spring term 2017/2018), Master in complex systems science, Universidad Autonoma de la Ciudad de México, Mexico City (November 2016), University of Florence, Physics Department (January 2016), Tsinghua University, Zhou Pei-Yuan Center for Applied Mathematics, Beijing, China (November 2013).

Physics and mathematics of diffusive phenomena in biology (Ph.D. course) Lectures notes available at: <u>http://dirac.cnrs-orleans.fr/~piazza/PB/teaching.html</u> ERASMUS, Department of Physics, University of Florence (March 2011, May 2012)

### Undergraduate courses at University of Orléans (since 2010) D: Travaux Dirigés, C: Cours magistraux, TP: Travaux Pratiques, Ba: Bachelor, Ma: Master

As a university professor, I am required to teach 192 hours/year (frontal) according to the rules of the French university system, independently of the rank, career status or research activities. This has to include a fair share of each of the following teaching activities: (i) *cours magistraux* (lectures excathedra), (ii) *travaux dirigés* (exercise sessions) and (iii) *travaux pratiques* (laboratory sessions). Hereafter, a list of the courses I have been teaching more regularly during the years, covering undergraduate (*Licence*) and postgraduate (Master and PhD) levels, with a concise description of the class content.

Soft Matter Physics (2<sup>nd</sup> year Master, C+TD)

Introduction to polymer physics, random walks, the freely-jointed chain, the Gaussian chain, transfer matrix approaches, force-elongation relations for stretched polymers, models of mechanical unzipping of biomolecules.

Condensed Matter Physics (1<sup>st</sup> year Master, C+TD)

Introduction to condensed matter physics. Electrons in solids, electronic bands, semiconductors, vibrations in solids, phonons, diamagnetism, paramagnetism, magnetic order (mean-field theory), magnetic domains, Ising model and transfer matrix formalism.

Computer programming and computational physics (3rd y Ba, C+TP)

Introduction to computational physics. Numerical differentiation and integration of functions, numerical integration of ordinary differential equations, introduction to Monte Carlo methods. All the coding is done in Python.

Introduction to scientific computing (2<sup>nd</sup> y Ba, C + TP)

Topics covered included: Introduction to dynamical systems, bifurcations, chaos. Introduction to numerical methods for the solution of partial differential equations (explicit and implicit differences methods). All coding is done in Python.

Elasticity theory of solids (1<sup>st</sup> y Master, C+TP)

*Cartesian tensors, vector calculus, strain, stress, elastic constants and lattice symmetry, propagation of sound waves in solids.* 

Mathematical methods for physics (2<sup>nd</sup> y Ba, C+TD).

Numerical sequences and series, convergence properties and methods to compute their limits. Fourier series, theory and applications.

Biophysics (2nd y Ba, C+TD)

Introduction to the physics and mathematics of diffusion. Jump processes, random walks, solution of stationary diffusion and Smoluchowski equation in different geometries, diffusion to capture.

Physics laboratory, TP (1<sup>st</sup> year, L1).

Point mechanics and thermodynamics experiments.

Earlier teaching activities (Ecole Polytechnique Fédérale de Lausanne, EPFL).

Teaching assistant for the course: <u>Advanced statistical physics II and III</u>, Supervision of fourth-year projects in numerical methods, Supervision of Master and fourth-year Practical work (TP) students.

# SELECTED PUBLICATIONS

full list available at

http://dirac.cnrs-orleans.fr/~piazza/PB/publications.html

L. Bongini, D. Fanelli, F. Piazza, P. De Los Rios, S. Sandin and U. Skoglund, Freezing Immunoglobulins to see them move, PNAS, 101, 6466-6471 (2004)

F. Piazza, P. De Los Rios and Y.-H. Sanejouand, Slow energy relaxation of macromolecules and nano-clusters in solution, Phys. Rev. Lett. - 94, 145502 (2005)

S. Ciliberti, P. De Los Rios and F. Piazza, Glass-like structure of globular proteins and the boson peak, Phys. Rev. Lett. - 96, 198103 (2006)

B. Juanico, Y.-H. Sanejouand, F. Piazza and P. De Los Rios, Discrete breathers in nonlinear network models of proteins, Physical Review Letters - 99, 238104 (2007)

F. Piazza, Surface effects in nonlinear distributed systems: slow relaxation and spontaneous emergence of localized coherent modes, invited book chapter for "New Research on Nonlinear Phenomena", T. Perlidze ed. Nova Science Publishers, NY (2008),

F. Piazza and Y.-H. Sanejouand, Discrete breathers in protein structures, Physical Biology - 5, 026001 (2008). Featured in the Nature - 454, 5 (2008) Journal Club by P. Csermely

F. Piazza, P. De Los Rios and F. Cecconi, Temperature dependence of normal mode reconstructions of protein dynamics, Physical Review Letters - 102, 218104 (2009)

**F.** Piazza and Y.-H. Sanejouand, Long-range energy transfer in proteins, Physical Biology - 6, 046014 (2009)

N. Dorsaz, C. De Michele, F. Piazza, P. De Los Rios and G. Foffi, Diffusion-limited reactions in crowded environments, Physical Review Letters - 105, 120601 (2010). *Our paper has been covered in a Viewpoint on the online review Physics* : Huang-Xiang Zhou, "Speeding up in a crowd", Physics - 3, 77 (2010)

N. Dorsaz, C. De Michele, F. Piazza and G. Foffi, Inertial effects in diffusion-limited reactions Journal of Physics C; Condensed Matter - 22, 104116 (2010)

A. Zaccone, N. Dorsaz, F. Piazza, C. De Michele, M. Morbidelli and Giuseppe Foffi Crowding, intermolecular interactions, and shear-flow effects in the diffusion model of chemical reactions, Journal of Physical Chemistry - 115(22), 7383-7396 (2011)

P. Csermely, K. Singh Sandhu, E. Hazai, Z. Hoksza, H. J.M. Kiss, F. Miozzo, D. V. Veres, F. Piazza, R. Nussinov, Disordered proteins and network disorder in network descriptions of protein structure, dynamics and function. Hypotheses and a comprehensive review, Current Protein and Peptide Science - 13(1), 9-33 (2012)

Carlo Maffi, Marco Baiesi, Lapo Casetti, Francesco Piazza and Paolo De Los Rios, First order coilto-globule transition driven by vibrational entropy, Nature Communications - 3, 1065 (2012)

F. Piazza, G. Foffi and C. De Michele, Irreversible bimolecular reactions with inertia: from the trapping to the target setting at finite densities, Journal of Physics C - Condensed Matter - 25, 245101 (2013).

G. Foffi, A. Pastore, F. Piazza and P.A. Temussi Macromolecular crowding: chemistry and physics meet biology, Ascona 2012. Physical Biology, focus section on Macromolecular crowding effects, 10, 040301 (2013)

F. Piazza, P. De Los Rios, C. De Michele, N. Dorsaz and G. Foffi, Diffusion-limited reactions in crowded environments: a local density approximation, Journal of Physics C - Condensed Matter - 25, 375104 (2013)

M. Galanti, D. Fanelli and F. Piazza, Persistent random walk with exclusion: a model for pulse propagation in dense media, Eur. J. Phys. B - 86, 1-5 (2013)

M. Galanti, D. Fanelli, A. Maritan and F. Piazza, Diffusion of tagged particles in a crowded medium, Europhys. Letters - 107, 20006 (2014)

F. Piazza, Nonlinear excitations match correlated motions unveiled by NMR in proteins: a new perspective on allosteric cross-talk, Physical Biology - 11, 036003 (2014)

E. Spiga, L. A. Abriata, F. Piazza, M. Dal Peraro, Dissecting the Effects of Concentrated Carbohydrate Solutions on Protein Diffusion, Hydration and Internal Dynamics, Journal of Physical Chemistry B - 118(20), 5310-5321 (2014)

F. Piazza and S. D. Traytak, Diffusion-influenced reactions in a hollow nano-reactor with a circular hole, Physical Chemistry Chemical Physics (PCCP) - 17, 10417-10425 (2015)

Jean-Yves Dewavrin, Muhammed Abdurrahiem, Anna Blocki, Mrinal Musib, Francesco Piazza and Michael Raghunath, Synergistic Rate Boosting of Collagen Fibrillogenesis in Heterogeneous Mixtures of Crowding Agents, Journal of Physical Chemistry B - 119(12), 4350-4358 (2015)

F. Di Patti, D. Fanelli and F. Piazza, Optimal search strategies on complex multi-linked networks Scientific Reports - 5, article number 9869 (2015)

S. Aubailly and F. Piazza, Cutoff lensing: predicting catalytic sites in enzymes, Scientific Reports – 5, Article number: 14874 (2015). CNRS.

Press coverage: http://www.cnrs.fr/inc/communication/direct\_labos/piazza.htm

M. Galanti, D. Fanelli and F. Piazza, Conformation-controlled binding kinetics of antibodies Scientific Reports - 6, Article number: 18976 (2016).

Press coverage: https://oggiscienza.it/2016/01/26/anticorpi-antigeti-biotecnologie-molecole/

C. De Michele, P. De Los Rios, G. Foffi and F. Piazza, Simulation and theory of antibody binding to crowded antigen-covered surfaces, Plos Computational Biology – **12**(3), e1004752-- (2016) M. Galanti, D. Fanelli, S. D. Traytak and F. Piazza, Theory of diffusion-influenced reactions in complex geometries, Physical Chemistry Chemical Physics – **18**, 15950-15954 (2016)

M. Galanti, D. Fanelli, S. Angioletti-Uberti, M. Ballauff, J. Dzubiella and F. Piazza, Reaction rate of a composite core-shell nanoreactor with multiple, spatially distributed embedded nano-catalysts Physical Chemistry Chemical Physics - 18, 20758-20767 (2016) (2016)

M. Galanti, D. Fanelli and F. Piazza, Macroscopic transport equations in many-body systems from microscopic exclusion processes in disordered media: a review, Frontiers in Physics, section Biophysics – 00033 (2016)

S. Pouyandeh, S. Iubini, S. Jurinovich, Y. Omar, B. Mennucci, F. Piazza, Exciton transport in the PE545 complex: insight from atomistic QM/MM-based quantum master equations and elastic network models, *Physical Biology* – 14, 066001 (2017)

A. Sozza, F. Piazza, M. Cencini, F. De Lillo, G. Boffetta, Point-particle method to compute diffusion-limited cellular uptake, *Physical Review E* – **97**, 023301 (2018)

R. Roa, S. Angioletti-Uberti, Y. Lu, J. Dzubiella, F. Piazza, and M. Ballauff, Catalysis by metallic nanoparticles in solution: Thermosensitive microgels as nanoreactors, *Z. Phys. Chemie* – Published Online: 2018-03-13 | DOI: https://doi.org/10.1515/zpch-2017-1078.

M. Asllani, T. Carletti, F. Di Patti, D. Fanelli, F. Piazza, Hopping in the crowd to unveil network topology, *Physical Review Letters*, 120 158301 (2018).

# TALKS AND SEMINARS

- 18<sup>th</sup> December 2018, "Ultra-coarse-grained models to simulate ligand-receptor kinetics of complex multivalent molecules", Laboratoire Adhésion & Inflammation (LAI), Université Aix-Marseille (invited seminar).
- 13<sup>th</sup> October 2018, "Non-equilibrium chemical kinetics: insight into prebiotic chemistry", 2018 international workshop on complexity in engineering (COMPENG 2018), Florence, Italy (contributed talk).
- 12<sup>th</sup> September 2018, "Coarse-grained elastic and nonlinear network models of proteins: surprises from the high-frequency end", CECAM workshop on "Normal modes of biological macromolecules: methods and applications", Paris (invited talk).
- 24<sup>th</sup> April 2018, "Transient localization of gap modes in NaI crystals at high temperature: insight and questions from wavelet analysis", VI International Symposium on Strong Nonlinear Vibronic and Electronic Interactions in Solids, Tartu, Estonia (invited seminar).
- 21<sup>st</sup> November 2017, "Back into a real medium: how the environment modulates the mobility and reactivity of molecules in complex soft matter systems", Institute of Theoretical Physics, Ecole Polytechnique Fédérale de Lausanne (EPFL), (invited seminar).
- 2<sup>nd</sup> August 2017, "Diffusion of small ligands in complex confining and reactive landscapes: the geometry of chemoreception", International ECI conference "Association in solution IV", Memorial University, St John's, Newfoundland, Canada (invited seminar).
- 25<sup>th</sup> July 2017, "Ultra-coarse-grained models to simulate ligand-receptor kinetics of complex multivalent molecules", Department of Chemical Engineering, University of Delaware, USA (invited seminar).
- 4<sup>th</sup> July 2017, "Back into a real medium: how the environment modulates the mobility and reactivity of molecules in complex soft matter systems", International Conference "Recent advances in basic and applied science in cosmetics", Tours (invited lecture).
- 25<sup>th</sup> April 2017, "Diffusion of small ligands in complex confining and reactive landscapes: the geometry of chemoreception", Namur center for Complex Systems (NAXYS), University of Namur (invited seminar).
- 5<sup>th</sup> April 2017, "Ultra-coarse-grained methods to simulate the binding kinetics of complex multi-valent flexible biomolecules", Séminaire LabEx MAbImprove, Tours (invited seminar).
- 26<sup>th</sup> September 2016, "Avidity and cooperativity in ligand-binding kinetics of multispecific complex architectures", Helmholtz Zentrum Berlin (invited seminar).

- 8<sup>th</sup> June 2016, "Diffusion of small ligands in complex confining and reactive landscapes: the geometry of chemoreception", XXV Sitges international conference on Statistical mechanics, Barcelona (invited speaker).
- 29<sup>th</sup> January 2016, "Physics of biological systems: coarse-grained models of protein dynamics and transport", Department of Physics, University of Trento, Italy (invited seminar).
- 29th September 2015, "Exactly solvable models for the rate constant of modern nano-reactors", Italian National Conference on Condensed Matter Physics (FISMAT 2015), Palermo, Italy (invited seminar).
- 16th July 2015, "Diffusion of a tracer particle among many sinks: the diffusive interaction". Summer school "Non-standard transport, NST@GSSI", Gran Sasso Science Institute, in partnership with SISSA (invited lecture).
- 2nd May 2015, "Nonlinear localized modes in biomolecular structures", V International Symposium on Strong Nonlinear Vibronic and Electronic Interactions in Solids, Tartu, Estonia (invited lecture).
- 3rd April 2015, "Biological physics and complex systems", institute seminar (cycle seminaires du café), Centre de Biophysique Moléculaire, Orléans, France.
- 19th March 2015, "Coarse-grained models in biology. From protein dynamics to diffusion and reaction in complex natural and artificial nano-systems", Dipartimento di Fisica, Università di Trento, Italy (invited seminar).
- 18th february 2015, "Coarse-grained elastic and nonlinear models of proteins: surprises from the high-frequency end". International Conference "Physical Biology of Proteins and Peptides: Theory, Experiment and Simulation", Mexico city (invited lecture canceled).
- 22nd January 2015, "Diffusion-influenced reactions in complex systems: from cells to nanoreactors", Helmholtz Zentrum Berlin, Germany (invited seminar).
- 27th November 2014, "Diffusion-influenced reactions in complex media", Unité Fonctionnalité et Ingénierie des Proteines, Université de Nantes (invited seminar).
- 17th July 2014, "Diffusion-influenced reactions in complex media", CECAM workshop "The self-organized cytoplasm", Lausanne, Switzerland (contributed talk).
- 20th June 2014, "Diffusion-influenced reactions in complex media", Physics-Biology interface seminar, Université Paris Sud, Orsay, France (invited seminar).
- 25th May 2014, "Macromolecular crowding effects in collagen fibrillogenesis", Laboratoire de Physique des Solides (LPS), Université Paris Sud, Orsay, France (invited seminar).
- 22nd May 2014, "Horror vacui: la matière et son absence d'Aristote à la Mécanique Quantique", workshop "Quel avenir pour les matérialistes" 20-24 May 2014, Lycée Voltaire, Orléans (invited lecture).
- 21st November 2013, "Nonlinear network model (NNM) : the role of nonlinear localized modes in storage and energy transfer process in proteins", Tsinghua University, Beijing, China (invited seminar).
- 25th June 2013, "Vibranti storie di tipi solitari dai modi discreti", XVIII Convegno Nazionale di Fisica della materia, Università di Parma, Italy (invited talk).
- 18th June 2013, "Transport in complex systems: from microscopic exclusion processes to modified diffusion equations", International Conference Interactions in Complex Systems (ISC), Orléans (invited talk).
- 9th October 2012, "Nonlinear Network Model (NNM): the role of nonlinear localized Discrete Breather modes in storage and energy transfer processes in proteins". CECAM workshop "Signaling pathways: Interplay between microscopic changes and global behavior of biological systems", ENS-Cachan, France (invited talk).
- 9th July 2012, "Discrete Breathers and allosteric communication in proteins", 2nd Conference on Localized Excitations in Nonlinear Complex Systems (LENCOS'12), Sevilla, Spain (invited talk).
- 29th May 2012 "From basic science to technology: a brief journey through some of the greatest achievements of human genius", Lycée Benjamin Franklin, Orléans (invited lecture).

- 15th March 2012, "The role of Nonlinear modes in energy transfer and storage phenomena in proteins", Université Paris VI, France (invited seminar).
- 23rd November 2011, "The role of Nonlinear modes in energy transfer and storage phenomena in proteins", Atelier "Gros-Grains" 2012, Institut de Biologie Physico-Chimique, Paris, France (invited talk).
- 3rd November 2011, "Nonlinear network model of biomolecular dynamics: studying long-range correlated motions in proteins", University of Bern, Switzerland (invited seminar).
- 18th July 2011, "Nonlinear Stabilization through Discrete Breather Excitation of Apo-Complex Conformational Changes in BRD4 Bromodomains", Semmelweiss University, Budapest, Hungary (invited seminar).
- 15 February 2011, "Extreme Coarse-grained dynamics of large bio-molecules, International STUDIUM Conference "Cosmetics and Pharmaceutics : new trends in biophysical approaches, Orléans, France (invited seminar).
- 3 December 2010 "Coarse-grained approaches to protein functional dynamics", 13-ème journée du projet CaSciModOT, delegation CNRS d' Orléans (invited talk).
- 17 September 2010, "Modèles à grain grossier de la dynamique des protéines", Centre de Biophysique Moléculaire (CBM), Orléans (invited seminar).
- 16 April 2010 "Nonlinear dynamics of disordered systems: storage and transfer of energy in proteins", Department of Physics, University of Rome "La Sapienza" (invited seminar).
- 23 December 2009, "Nonlinear dynamics of disordered systems", Department of Physics, University of Florence (invited seminar).
- 19 June 2009, "Energy transfer in nonlinear network models of proteins", ETH Zurich, USI campus, Lugano (invited seminar).
- 9 December 2008, "Localization and energy transfer in nonlinear many-body systems with disorder: the case of corse-grained network models of proteins", IFISC, University of Balear islands, Spain (invited seminar).
- 2 June 2008, "Discrete breathers in nonlinear network models of proteins", XXI SITGES Conference on statistical mechanics, Sitges, Spain (invited seminar).
- 25 March 2008, "Discrete breathers in nonlinear network models of proteins", Laboratoire J. Kuntzmann, ENSIMAG, Grenoble (invited seminar).
- 21 March 2008, "Discrete breathers in nonlinear network models of proteins", Laboratoire J. Dieudonné, Université de Nice (invited seminar).
- 6 March 2008, "Discrete breathers in nonlinear network models of proteins", ICTP, Trieste, Italy (invited seminar).
- 16 January 2007, "Discrete breathers in nonlinear network models of proteins", Centre de Physique Théorique, Université de la Méditerranée Aix-Marseille, France (invited seminar).
- 19 December 2007, "Discrete breathers in protein structures", Ecole Normale Superieure de Lyon (invited seminar).
- 12 November 2007. "Discrete breathers in nonlinear network models of proteins", Bayreuth University, Germany (invited seminar).
- 11 June 2007. "Freezing proteins to see them move", Department of Physics, Edinburgh University, UK (invited seminar).
- 23 November 2006. "Binding dynamics of PDZ domains. A comprehensive view through coarse-grained models". Laboratory of Theoretical Biochemistry, UPR 9080 CNRS / PARIS 7 UNIVERSITY (invited seminar).
- 2<sup>nd</sup> October 2006. "Surface effects in non-linear distributed systems: slow relaxation and spontaneous emergence of localized coherent modes". Ecole Normale Superieure de Lyon, (invited seminar).
- 5-9 June 2006. XX SITGES CONFERENCE on STATISTICAL MECHANICS, Physical Biology: from Molecular Interactions to Cellular Behavior. Sitges, Barcelona, SPAIN, "Functional dynamics of proteins and normal modes at working temperatures" (poster).

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- 13 March 2006. School of Physical Sciences, JNU, New Delhi. "A critical view on slow energy relaxation in complex systems" (invited seminar).
- 1-3 March 2006. International Workshop on Nano-Biosciences, Kolkata University, India. "Vibrational properties and relaxation mechanisms in proteins and nano-particles: theoretical aspects and applications" (invited lecture).
- 14-16 November 2005: International Conference "Nanoscience & Nanotechnology 2005", Monteporzio Catone, (Roma), Italy. "Slow energy relaxation and energy transfer in biomolecules and nano-clusters" (poster).
- 29 June 2005: Laboratoire Joliot-Curie, Ecole Normale Superieure de Lyon (ENS-Lyon). "Freezing proteins to see them move" (invited seminar).
- 15–19 May 2005: Workshop Flexibility in Bio-molecules, Tempe (AZ), USA. "Slow energy relaxation of Macromolecules and Nanoclusters in Solution" (poster).
- 3–4 March 2005: Nonlinear double day (NLDD005), Sevilla (Spain). "Slow Energy Relaxation in Linear and Nonlinear Systems" (invited talk).
- 11–13 February 2004: BIFI 2004 Biology after the genome: a physical view, I International Conference, Zaragoza (Spain). "Freezing Immunoglobulins to see them move" (contributed talk).
- 3–5 February 2003, II mini-school of biology, Center for the study of complex systems of the University of Florence, Italy. "Random walks in biology" (invited lecture).
- July 2002: Invited lecture "Statistical analysis of DNA sequences: a review", International IP-Socrates summer school 2002, Villa Agape, Florence, Italy.
- 17–21 June 2002: San Lorenzo de El Escorial, Spain, International Workshop Localization and Energy transfer in Nonlinear Systems. "Cooling non-linear lattices till energy localization" (contributed talk).
- 23–27 March 2002: Arcachon (FR), International workshop DNA in chromatin, at the frontiers of physics and biology. "Study of low-complexity DNA sequences in Eukaryotes and Prokaryotes" (poster).
- 13–17 June 2001: Eu-Us International Workshop on Discrete Breathers/Intrinsic Localized Vibrations, FORTH, Heraklion, Crete. "Slow energy relaxation and Localization in 1D and 2D lattices" (contributed talk).
- 29 August–10 September 1999: EPSRC-Theory of Condensed Matter Summer School, Coleg Harlech, Wales. Org. Prof. JMF Gunn, University of Birmingham.