

# CURRICULUM VITAE

## FERNANDO PERUANI

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### CURRENT POSITION

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- Tenured lecturer/Associated professor (Maître de conférences in the French system) at the Université de Nice Sophia Antipolis

### EDUCATION and PROFESSIONAL EXPERIENCE

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- 2012-present
  - Associated professor/Tenured lecturer (maître de conférences titulaire). Laboratoire J.A. Dieudonné UMR 7351. Université de Nice - Sophia Antipolis.
- 2011- 2012
  - Assistant professor / lecturer (maître de conférences stagiaire). Laboratoire J.A. Dieudonné UMR 7351. Université de Nice - Sophia Antipolis.
- 2010 – 2011
  - Post-doctoral fellow at the Max Planck Institute for the Physics of Complex Systems, Dresden. Germany.
- 2008 - 2010
  - Post-doctoral fellow at the CNRS and CEA, Paris and Saclay. France.
- 2003 - 2007
  - PhD at the Max Planck Institute for the Physics of Complex Systems and the Technische Universität Berlin. Germany
  - Subject: “From individual to collective motion of self-propelled particles: The role of particle shape, orientational ordering and clustering”
  - Dissertation: January 2008 at the Fakultät II – Mathematik und Naturwissenschaften Technische Universität Berlin. Mark: “sehr gut”. Supervisor: Prof. Dr. Markus Bär.
- 1997-2002
  - Studies in Physics at the University of Buenos Aires, Argentine.
  - Final research project: “Stochastic models for the dielectric breakdown”

## HONORS & SCHOLARSHIPS

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- Visiting fellow at the Isaac Newton Institute, Cambridge University (2013), United Kingdom.
- Prime d'excellence scientifique (2012-2016), France.
- Max Planck post-doctoral fellowship (2010-2011), Germany.
- CEA post-doc fellowship (2009), France.
- CNRS post-doc fellowship (2008), France.
- PhD Scholarship between Max Planck Institute for the Physics of Complex Systems and Technische Universitaet Dresden (2003-2007), Germany.
- "Honor diploma" (2003), University of Buenos Aires, Argentina.
- Young researcher scholarship UBACyT (2002), Argentina.

## GRANTS

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- French node of the German DPG Project 2013-2018: "Chemical regulation of aggregation and pattern formation of gliding bacteria".
- PI of the CNRS Project 2012: "Anomalous fluctuations in the collective motion of self-propelled particles".
- Partner of the CNRS-Inserm-Inria project 2012-2013: "Topology and symmetry of the interactions in animal collective motion". PI: Jacques Gautrais.
- Partner of the CNRS-Inserm-Inria project 2012-2013: "NeuroConf: Modelisation and simulation of realistic neuronal models". PI: Matthieu Lerasle.

## ORGANIZED WORKSHOPS

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- Dynamics of passive and active particles: transport and collective phenomena. Nice, France. December 2013. Co-organized with Dario Vincenzi, Pavel Kuhzir and Stefano Musacchio. [http://math.unice.fr/~peruani/workshopAT/Dynamics\\_of\\_passive\\_and\\_active\\_particles.htm](http://math.unice.fr/~peruani/workshopAT/Dynamics_of_passive_and_active_particles.htm)
- Dynamics on and of complex networks 11, satellite workshop of ECCS11. Vienna, Austria. September 2011. Co-organized with N. Ganguly, A. Mukerjee, B. Mitra, and M. Chaudhuri. <http://www.mpijks-dresden.mpg.de/~peruani/doocn2011/>
- Dynamics on and of complex networks 10, satellite workshop of ECCS10. Lisbon, Portugal. September 2010. Co-organized with N. Ganguly, A. Mukerjee, and M. Chaudhuri.
- Dynamics on and of complex networks 09, satellite workshop of ECCS09. Warwick, UK. September 2009. Co-organized with N. Ganguly, A. Deutsch, and E. Fleury.
- Dynamics on and of complex networks 08, satellite workshop of ECCS08. Jerusalem, Israel. September 2008. Co-organized with N. Ganguly and A. Deutsch.

## TEACHING EXPERIENCE

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- Lecturer of Irreversible Physics [for second year master students in Physics and Mathematics], University of Nice Sophia Antipolis. (Spring 2013)
- Lecturer of Thermodynamics [for second and third year undergraduates, Physics], University of Nice Sophia Antipolis. (Fall 2013, fall 2012, spring 2012, fall 2011).
- Lecturer of Non-linear dynamics [for third year undergraduates, Physics], University of Nice Sophia Antipolis. (Fall 2013, fall 2012).
- Lecturer of Physics for Biology [for first year undergraduates, Biology], University of Nice Sophia Antipolis. (Spring 2013, spring 2012).

- Lecturer of “Collective motion” [for second year master students in Physics and Mathematics], University of Nice Sophia Antipolis. (Fall 2011).
- Teaching Assistant of classical mechanics, Universidad de Buenos Aires, Argentina. (From March 2002 to July 2003).
- Teaching Assistant of calculus, Universidad de Buenos Aires, Argentina. (From March 1999 to July 2003).

## **PhD STUDENTS and POST DOCS**

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- Sylvain Toulet (PhD student in co-direction with Richard Bon, Université Paul Sabatier, Toulouse III, France).  
Subject: “Self-organized collective migrations in vertebrates: information transfer and individual decision”.  
Dissertation: expected in 2015
- Oleksandr Chepizkho (PhD student in co-direction with Vladimir Kulinski, University of Odessa, Ukraine)  
Subject: “Kinetic models for self-propelled particle systems”.  
Dissertation: expected in March 2014
- Lucas Barberis (post-doc 9/2013 – 3/2014)  
Subject: “Rheology of active matter”
- Guillermo Terranova (post-doc 3/2012 – 9/2012)  
Subject: “Transport properties in self-propelled discs systems”.

## **INVITED TALKS AND SEMINARS**

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More than 35 invited talks and seminars. The list below includes only those from 2011 on:

- Workshop of WE Heraeus “Statistical physics of cell propelled particles”, Bad Honnef, Germany, June 2014. Title to be announced.
- Workshop “Physics of behaviour” within the March meeting of the APS, Denver, USA, March 2014. Title to be announced.
- Seminar at LPMC, Université de Nice, France, October 2013. Title: “Quasi long range order and subdiffusion in system of active particles in heterogenous media”.
- Workshop “Non-standard Transport Processes”, Ecole Normale Supérieure, Lyon, France, September 2013. Title: “Diffusion, subdiffusion and superdiffusion of active particles in heterogenous media”.
- Seminar at the Isaac Newton Institute, Cambridge University, United Kingdom, July 2013. Title: “From bacteria to collective motion in heterogeneous media”.
- Seminar at Imperial College London, United Kingdom, July 2013. Title: “From bacteria to collective motion in heterogeneous media”.
- Workshop: “PCA: Theory, Applications and Future Perspectives”, Technical University Eindhoven, Netherlands, June 2013. Title: “Optimal noise maximizes collective motion in heterogeneous media”.
- Satellite workshop of NetSci “Networks Over Time”, Technical University of Denmark, Copenhagen, June 2013. Title: “Information flow in mobile phone communication networks”.
- Seminar at naXys, Université de Namur, Belgium, May 2013. Title: “Fluctuations in epidemic models: from complex networks to lattice models, and from mean-field approaches to field equations”.
- Workshop "Collective motion: from data to models", Bielefeld Universität, Germany, November 2012. Title: "From bacteria to collective motion in heterogeneous media".

- Seminar at ESPCI, Paris, France, October 2012. Title: "From bacteria to collective motion in heterogeneous media".
- Workshop "Physics of Bacterial Communities", University of Notre Dame, Chicago, USA, June 2012. Title: "Collective motion and nonequilibrium cluster formation in colonies of gliding bacteria".
- Bristol University, Bristol, United Kingdom, May 2012. Title: "Collective motion and nonequilibrium cluster formation in colonies of gliding bacteria".
- Active matter workshop Lyon, France, May 2012. Title: "Collective motion and nonequilibrium cluster formation at high density".
- Workshop "Complex networks", Dresden, Germany, May 2012. Title: "Directedness of information flow in mobile phone networks".
- Workshop "Collective behavior in active agent systems". Toulouse, France, November 2011. Title: "Transition to collective motion in gliding bacterial colonies".
- Seminar at the research group on large graphs and networks, Université catholique de Louvain. Louvain-la-Neuve, Belgium, October 2011. Title: "Directedness of information flow in mobile phone networks".
- Workshop "Collective Dynamics and Pattern formation in Active Matter Systems". Dresden, Germany, September 2011. Title: "Cluster statistics and obstacles in systems of self-propelled particles".
- "European Biophysics Congress 2011" (EBSA11). Budapest, Hungary, August 2011. Title: "Transition to collective motion in bacterial colonies".
- Conference "Engineering of Chemical Complexity". Berlin, Germany, July 2011. Title: "Transition to collective motion in bacterial colonies".
- Workshop "Individual and Collective Dynamics in Active Suspensions". IHP, Paris, France, June 2011. Title: "Transition to collective motion in bacterial colonies as dynamical self-assembly of self-propelled rods".
- Symposium "Active particle systems". Berlin, Germany, May 2011. Title: "Transition to aggregation in bacterial colonies: myxobacteria mutants as self-propelled rods".
- Invited seminar at Frey's group, LMU. Munich, Germany, May 2011. Title: "Information cascades and flow in mobile phone communication networks".
- IZKS Kolloquium, Bonn, Germany, February 2011. Title: "From individual to collective behavior - aggregation and large-scale patterns in myxobacteria".

## REFeree EXPERIENCE

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- Proceedings of the National Academy of Science, Physical Review Letters; Physical Review E; Physica D, European Physical Journal B; PLoS – Computational Biology; PLoS ONE, Multidisciplinary Journal of Microbial Ecology, etc.

## PUBLICATIONS

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### International journals:

1. O. Chepizhko and F. Peruani, "Diffusion, subdiffusion, and trapping of active particles in heterogeneous media", Phys. Rev. Lett. **111**, 160604 (2013)  
<http://dx.doi.org/10.1103/PhysRevLett.111.160604>
2. N. Ganguly, S. Saha, A. Maiti, S. Agarwal, F. Peruani, A. Mukherjee, "Effect of attachment strategies on bipartite networks", Eur. Phys. J. B **86**, 287 (2013)  
<http://dx.doi.org/10.1140/epjb/e2013-30662-x>

3. F. Peruani and M. Bär, “A kinetic model and scaling properties for non-equilibrium clustering of self-propelled particles”, *New J. Phys.* **15**, 065009 (2013)  
<http://dx.doi.org/10.1088/1367-2630/15/6/065009>
4. O. Chepizhko, E. Altmann, and F. Peruani, “Optimal Noise Maximizes Collective Motion in Heterogeneous Media”, *Phys. Rev. Lett.* **110**, 238101 (2013)  
<http://dx.doi.org/10.1103/PhysRevLett.110.238101>
5. F. Peruani and C.F. Lee, “Fluctuations and the role of collision duration in reaction-diffusion systems”, *Europhys. Lett.* **102**, 58001 (2013)  
<http://dx.doi.org/10.1209/0295-5075/102/58001>
6. J. Starruss, F. Peruani, V. Jakovljevic, L. Soogard-Andersen, A. Deutsch, and M. Bär, “Pattern-formation mechanisms in motility mutants of *Myxococcus xanthus*”, *Interface Focus* vol. **2** no. **6** 774-785 (2012)  
<http://dx.doi.org/10.1098/rsfs.2012.0034>
7. A. Srivastava, B. Mitra, N. Ganguly, and F. Peruani, “Correlations in complex networks under attack”, *Phys. Rev. E* **86**, 036106 (2012).  
<http://dx.doi.org/10.1103/PhysRevE.86.036106>
8. F. Peruani, J. Starruss, V. Jakovljevic, L. Sogaard-Andersen, A. Deutsch, and M. Bär, “Collective motion and nonequilibrium cluster formation in colonies of gliding bacteria”, *Phys. Rev. Lett.*, **108**, 098102 (2012)  
<http://dx.doi.org/10.1103/PhysRevLett.108.098102>
9. F. Peruani and L. Tabourier, “Directedness of information flow in mobile phone communication networks”, *PLoS ONE* **6**, e28860 (2011)  
<http://dx.doi.org/10.1371/journal.pone.0028860>
10. F. Peruani, F. Ginelli, M. Bär, and H. Chaté, “Polar vs. apolar alignment in systems of polar self-propelled particles”, *J. Phys.: Conf. Ser.* **297**, 012014 (2011)  
<http://dx.doi.org/10.1088/1742-6596/297/1/012014>
11. F. Peruani, T. Klaus, A. Deutsch, and A. Voss-Boehme, “Traffic jams, gliders, and bands in the quest for collective motion”, *Phys. Rev. Lett.* **106**, 128101 (2011)  
<http://dx.doi.org/10.1103/PhysRevLett.106.128101>
12. F. Peruani, L. Schimansky-Geier, and M. Bär, “Cluster dynamics and cluster size distributions in systems of self-propelled particles”, *Eur. Phys. J. Special Topics* **191**, 173-185 (2010)  
<http://dx.doi.org/10.1140/epjst/e2010-01349-1>
13. F. Peruani, E. Nicola, L. Morelli, “Mobility induces global synchronization of oscillators in extended systems”, *New J. Phys.* **12**, 093029 (2010).  
<http://dx.doi.org/10.1088/1367-2630/12/9/093029>
14. F. Ginelli, F. Peruani, M. Bär and H. Chaté, “Large-scale properties of a simple model for self-propelled rods”, *Phys. Rev. Lett.* **104**, 184502 (2010) (2010)  
<http://dx.doi.org/10.1103/PhysRevLett.104.184502>

15. M. Choudhury, N. Ganguly, A. Maiti, A. Mukherjee, L. Bruschi, A. Deutsch, F. Peruani, "Modeling discrete combinatorial systems as Alphabetic Bipartite Networks: Theory and Applications", *Phys. Rev. E* **81**, 036103 (2010).  
<http://dx.doi.org/10.1103/PhysRevE.81.036103>
16. F. Peruani, A. Maiti, S. Sadhu, H. Chaté, R. Choudhury, and N. Ganguly, "Delay Tolerance Networks with Omnidirectional and Directional Antenna", *IEEE Journal on Selected Areas in Communication* **28**, 524-531 (2010).  
<http://dx.doi.org/10.1109/JSAC.2010.100502>
17. H. Chaté, F. Ginelli, G. Gregoire, F. Peruani, and F. Raynaud, "Modeling Collective Motion: Variations on the Vicsek model", *Eur. Phys. J. B* **64**, 451 (2008).  
<http://dx.doi.org/10.1140/epjb/e2008-00275-9>
18. B. Mitra, N. Ganguly, S. Ghose and F. Peruani, "Stability Analysis of Peer-to-Peer Networks Against Churn", *Pramana - J. Phys.* **71**, 263 (2008).  
[www.ias.ac.in/pramana/v71/vol71.pdf](http://www.ias.ac.in/pramana/v71/vol71.pdf)
19. B. Mitra, N. Ganguly, S. Ghose and F. Peruani, "Generalized theory for node disruption in finite complex networks", *Phys. Rev. E* **78**, 026115 (2008).  
<http://dx.doi.org/10.1103/PhysRevE.78.026115>
20. F. Peruani and G. Sibona, "Dynamics and Steady States in Excitable Mobile Agent System", *Phys. Rev. Lett.* **100**, 168103 (2008).  
<http://dx.doi.org/10.1103/PhysRevLett.100.168103>
21. F. Peruani, A. Deutsch, M. Bär, "Mean field theory for the collective motion of self-propelled particles interacting by velocity alignment mechanisms", *European Physical Journal - Special Topics* **157**, 111 (2008).  
<http://dx.doi.org/10.1140/epjst/e2008-00634-x>
22. F. Peruani and Luis G. Morelli, "Self-propelled particles with fluctuating speed", *Phys. Rev. Lett.* **99**, 010602 (2007).  
<http://dx.doi.org/10.1103/PhysRevLett.99.010602>
23. F. Peruani, M. Choudhury, A. Mukherjee, N. Ganguly, "Emergence of a non-scaling degree distribution in bipartite networks: a numerical and analytical study", *Europhys. Lett.* **79**, 28001 (2007).  
<http://dx.doi.org/10.1209/0295-5075/79/28001>
24. F. Peruani, A. Deutsch, M. Bär, "Nonequilibrium clustering of self-propelled rods", *Phys. Rev. E*, **74**, 030904 (2006). *Rapid Communications*.  
<http://dx.doi.org/10.1103/PhysRevE.74.030904>
25. G. Solovey, F. Peruani, S. Ponce Dawson, R. M. Zorzenon dos Santos, "On cell resistance and immune response time lag in a model for HIV infection", *Physica A* **343**, 543 (2004).  
<http://dx.doi.org/10.1016/j.physa.2004.06.068>
26. P. Bergero, F. Peruani, G. Solovey, I.M. Irurzun, J.L. Vicente, E. E. Mola, "Dielectric breakdown model for conductor-loaded and insulator-loaded composite materials". *Physical Review E*, **69**, 016123 (2004).  
<http://dx.doi.org/10.1103/PhysRevE.69.016123>

27. F. Peruani, G. Solovey, I.M. Irurzun, E. E. Mola, A. Marzocca, J.L. Vicente, "Dielectric breakdown model for composite materials", *Physical Review E*, **67**, 066121 (2003).  
<http://dx.doi.org/10.1103/PhysRevE.67.066121>

### **Proceedings (with peer-review process)**

28. L. Tabourier, A. Stoica, and F. Peruani, "How to detect causality effects on large dynamical communication networks : a case study", *Proceedings of ComsNets2012, Bengaluru, India*. (2012).  
<http://dx.doi.org/10.1109/COMSNETS.2012.6151301>

29. A. Srivastava, B. Mitra, F. Peruani, N. Ganguly, "Attacks on Correlated Peer-to-Peer Networks: An Analytical Study", *SCNC 2011, The First IEEE International Workshop on Security in Computers, Networking and Communications in conjunction with IEEE INFOCOM* (2011).  
<http://dx.doi.org/10.1109/INFCOMW.2011.5928787>

30. G.J. Sibona, F. Peruani, G.R. Terranova, "Influence of the motion of individuals on the evolution of a SIRS epidemic", *Proceedings of BIOMAT 2011 International Symp. on Mathematical and Comp. Biology*. Ed. R. Mondaini, World Scientific co (2011).

31. B. Mitra, F. Peruani, S. Ghose, and N. Ganguly, "Analyzing the Vulnerability of Superpeers Networks Against Attack", proceeding at CCS 07 (14th ACM Conference on Computer and Communications Security) (2007).  
<http://doi.acm.org/10.1145/1315245.1315274>

32. B. Mitra, F. Peruani, S. Ghose, N. Ganguly, "Measuring robustness of Superpeer Topologies", Brief Announcement at PODC'07 (Twenty-Sixth Annual ACM SIGACT-SIGOPS Symposium on Principles of Distributed Computing) (2007).  
<http://doi.acm.org/10.1145/1281100.1281179>

### **Book chapters:**

33. F. Peruani, "Advances in Complex Networks", in: *Dynamics on and of Complex Networks: Applications to Biology, Computer Science, Economics, and the Social Sciences*, Birkhauser-Springer, Boston (2009).  
[http://dx.doi.org/10.1007/978-0-8176-4751-3\\_16](http://dx.doi.org/10.1007/978-0-8176-4751-3_16)

34. J. Starruss, F. Peruani, M. Bär, A. Deutsch, "Bacterial swarming driven by rod shape", in: *Mathematical Modeling of Biological Systems, Volume I: Cellular Biophysics, Regulatory Networks, Development, Biomedicine, and Data Analysis* (2007).  
<http://www.springerlink.com/content/14700168026u59t6/>

### **Books:**

35. M. Choudhuri, N. Ganguly, B. Mitra, A. Mukherjee, F. Peruani (2013) (eds.), "Time-varying dynamical complex networks", Birkhauser, Springer, Boston.

### **PhD Thesis:**

F. Peruani. "From individual to collective motion of self-propelled particles: the role of particle shape, orientation ordering and clustering".

Deutsche Nationalbibliothek: <http://deposit.ddb.de/cgi-bin/dokserv?idn=987576747>

**Master Thesis:**

F. Peruani. «Stochastic models for the dielectric breakdown»