

# Toni Pérez

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Born: March 10, 1978—Jerez de la Frontera, Spain

Nationality: Spanish

## Current position

*Postdoctoral Research Associate*, Institute for Cross-Disciplinary Physics and Complex Systems (IFISC)

## Areas of specialization

Physics • Complex Systems • Nonlinear Dynamics • Computational Neuroscience • Biophysics

## Education

2009 PHD in Physics, IFISC- Universitat de les Illes Balears, Palma de Mallorca.  
2004 MSC in Physics, Universitat de Barcelona, Barcelona.

## Appointments held

2013-present Postdoctoral Research Associate at IFISC, Spain  
2011-2012 Postdoctoral Research Associate at Newcastle University, Newcastle upon Tyne, UK  
2009-2011 Postdoctoral Research Associate at Lehigh University, Bethlehem, USA  
2005-2009 PhD Fellow at Intitute for Cross Disciplinary Physics and Complex Systems (IFISC), Palma de Mallorca, Spain

## Accreditations and Teaching

2012 Positive review from the National Spanish Agency for Quality and Accreditations (ANECA) for the positions of: Profesor Contratado Doctor (2012-210), Profesor Ayudante Doctor (2012-211) and Profesor de Universidad Privada (2012-212).  
2011-2012 Teaching Assistant at University of Newcastle. Computational Analysis of Complex Biological Systems, Bioinformatics, MSc.  
2006-2009 Teaching Assistant at University of Balearic Islands. Physics, Chemical Engineering Degree.

## Participation in Research Projects

- 2009-2011 *Kinetic Pathways to Phase Separation* (DMR-0702890). National Science Foundation. IP: James D. Gunton.
- 2007-2009 *Global Approach to Brain Activity: From Cognition to Disease* (FP6-2005-NEST-Path-043309). European Commission. IP: Claudio R. Mirasso
- 2006-2009 *Photonic Integrated Components Applied to Secure Chaos Encoded Optical Communications Systems* (PICASSO IST-2005-34551). European Commission. IP: Claudio R. Mirasso
- 2006-2009 *Dispositivos Fotónicos para Comunicaciones Basadas en Caos* (PhoDeCC). Plan Nacional de Tecnología Electrónica y de las Comunicaciones del MICINN. IP: Pere Colet
- 2006-2008 *Chaos Synchronization and On/Off Phase Shift Keying Encryption* (HA2005-0051). Acción Integrada España-Alemania. IP: Claudio R. Mirasso
- 2006 *Dinámica y sincronización de láseres de semiconductor y aplicaciones*. Ministerio de Ciencia y Tecnología. IP: Claudio R. Mirasso

## Stays at Research Centers

- 16/11/2009 to 20/11/2009 at the Department of Physics, Kansas State University, Manhattan, USA, under the supervision of Professor Amit Chakrabarti.
- 21/08/2008 to 14/11/2008 at the Department of Information and Computer Sciences, Saitama University, Saitama, Japan, under the supervision of Professor Atsushi Uchida.
- 18/05/2008 to 24/05/2008 at the Max-Planck-Institute for Brain Research, Frankfurt, Germany, in collaboration with Dr R. Vicente.
- 12/02/2006 to 12/10/2006 at the Institute für Physik, Humboldt Universität, Berlin, Germany, under the supervision of Professor H. J. Wünsche.
- 05/20/2006 to 07/23/2006 at the Institute of Neurophysiology, Benemerita Universidad de Puebla, Puebla, Mexico, under the supervision of Professor Elías Manjarrez.
- 02/19/2006 to 03/06/2006 at the Institute für Physik, Humboldt Universität, Berlin, Germany, under the supervision of Professor H. J. Wünsche.
- 06/20/2005 to 06/24/2005 at the Institute für Physik, Humboldt Universität, Berlin, Germany, under the supervision of Professor H. J. Wünsche.

## Seminars

- “Modeling and synchronization in neuronal networks”, 04/08/2011, Newcastle University, Newcastle upon Tyne, United Kingdom.
- “Effects of topology and delayed connections in a neuronal network”, 05/06/2008, IFISC, University of Balearic Islands, Palma de Mallorca, Spain.
- “Resonance in Biophysical Systems”, 10/18/2008, Saitama University, Saitama, Japan.
- “Introduction to neuronal systems: basics concepts about modeling neurones”, 10/17/2008, Saitama University, Saitama, Japan.
- “Resonance in Biophysical Systems”, 12/18/2007, IFISC, University of Balearic Islands, Palma de Mallorca, Spain.

- “*Synchronization in Biophysical Systems*”, 07/13/2006, Institute of Neurophysiology, Benemerita Universidad de Puebla, Puebla, Mexico.
- “*Chaos Synchronization: Applications to Data Encryption*”, 06/23/2005, Weierstrass Institute for Applied Analysis and Stochastic (WIAS), Berlin, Germany.

## Publications

### JOURNAL ARTICLES

19. Pérez, Toni; Kaiser, Marcus, “*Size doesn’t matter: Hierarchical neural networks lead to similar oscillations in rat and humans*”, submitted to *Frontiers in Computational Neuroscience* (2012)
18. Liu, Ya; Li, Wei; Pérez, Toni; Gunton, James; Brett, G., “*Self Assembly of Janus Ellipsoids*”, *Langmuir*, **28**, 3. (2012)
17. Li, Wei; Liu, Ya; Pérez, Toni; Gunton, James; Sorensen, C.M; Chakrabarti, A., “*Kinetics of nanochain formation in a simplified model of amelogenin biomacromolecules*”, *Biophysical Journal*, **101**, 2502. (2011)  
Selected for the cover of the *Biophysical journal*, Volume 101, Issue 10 (2011).
16. Pérez, Toni; Liu, Ya; Li, Wei; Gunton, James; Chakrabarti, A., “*Pathways of cluster growth and kinetics slowing down in a model of short-range attractive colloids*”, *Langmuir*, **27**, 11401. (2011)
15. Pérez, Toni; Eguíluz, Victor; Arenas, Alex, “*Inferring statistical structural properties from functional networks of delay-coupled oscillators*”, *Chaos*, **21**, 025111. (2011)
14. Pérez, Toni; Uchida, Atsushi, “*Reliability and synchronization in a delay-coupled neuronal network with synaptic plasticity*”, *Physical Review E*, **83**, 061915. (2011)
13. Pérez, Toni; Garcia, Guadalupe; Eguíluz, Victor; Vicente, Raúl; Pipa, Gordon; Mirasso, Claudio; “*Effect of the topology and delayed connections in a neuronal network*”, *PLoS ONE* 6(5): e19900. (2011)
12. Eguíluz, Victor; Pérez, Toni; Borge-Holthoefer, Javier; Arenas, Alex, “*Structural and functional networks in complex systems with delay*”, *Physical Review E*, **83**, 056113. (2011)
11. Liu, Ya; Pérez, Toni; Li, Wei; Gunton, James; Green, Amanda, “*Statistical mechanics of helical wormlike chain model*”, *Journal of Chemical Physics*, **134**, 065107. (2011)  
Selected for the February 2011 issue of *JCP: BioChemical Physics*  
Selected for the February 2011 issue of *Virtual Journal of Biological Physics Research*
10. Pérez, Toni; Mirasso, Claudio; Toral, Raúl; Gunton, James, “*The constructive role of diversity on the global response of coupled neuron systems*”, *Philosophical Transactions of the Royal Society A*, **368**, 5619-5632. (2010)
9. Pérez, Toni; Tapia, Jesus; Mirasso, Claudio; García-Ojalvo, Jordi; Quevedo, Jorge; Cuellar, Carlos; Manjarrez, Elias, “*An intersegmental neuronal architecture for deletion-proof spinal wave propagation*”, *Journal of Neuroscience*, **29**, 10254-10263. (2009)

8. Pérez, Toni; Scirè, Alessandro; Van der Sande, Guy; Colet, Pere and Mirasso, Claudio, "Bistability and all-optical switching in semiconductor ring lasers", *Optics Express*, **20**, 12941-12948. (2007)
7. Martínez, Lourdes; Pérez, Toni; Mirasso, Claudio; Manjarrez, Elías, "Stochastic Resonance in the Motor System: Effects of Noise on the Monosynaptic Reflex Pathway of the Cat Spinal Cord", *Journal of Neurophysiology*, **97**, 4007-4016. (2007)
6. Valerio Annovazzi-Lodi, Mauro Benedetti, Sabina Merlo, Toni Pérez, Pere Colet and Claudio R. Mirasso, "Message Encryption by Phase Modulation of a Chaotic Optical Carrier", *IEEE Photonics Technology Letters*, **19**, 76-78. (2007)
5. Pérez, Toni; Radziunas, Mindaugas; Wunsche, Hans-Jurgen; Mirasso, Claudio R.; Henneberger, Fritz, "Synchronization Properties of Two Coupled Multisection Semiconductor Lasers Emitting Chaotic Light", *IEEE Photonics Technology Letters*, **18**, 2135-2137. (2006)
4. C.R. Mirasso, R. Vicente, P. Colet, J. Mulet, and T. Pérez, "Synchronization Properties of Chaotic Semiconductor Lasers and Applications to Encryption", *Comptes Rendus de l'Académie de Sciences, Physique*, **5**, pp. 613-622, (2004).
3. J.M. Buldú, M.C. Torrent, J. García-Ojalvo, R. Vicente, T. Pérez, and C.R. Mirasso, "Low Frequency Fluctuations Entrainment is Enhanced by Coupling", *Fluctuation and Noise Letters*, **3**, pp.127-134, (2003).
2. J.M. Buldú, R. Vicente, T. Pérez, C.R. Mirasso, M.C. Torrent, and J. García-Ojalvo, "Periodic Entrainment of Power Dropouts in Mutually Coupled Semiconductor Lasers", *Applied Physics Letters*, **81**, pp. 5105-5107, (2002).
1. R. Vicente, T. Pérez, and C.R. Mirasso, "Open- versus Closed- Loop Performance of Synchronized Chaotic External Cavity Semiconductor Lasers", *IEEE Journal of Quantum Electronics* **38**, pp. 1197-1204 (2002).

#### PROCEEDINGS

6. Gunton, James D.; Li, Wei; Liu, Ya; Pérez, Toni; Khan, Siddique; Chakrabarti, Amit, "Some topics in the kinetics of protein aggregation", *Physics Procedia*, **4**, pp. 35-49, (2010).
5. Scirè, A. ; Pérez-Serrano, A. ; Pérez, T. ; Van der Sande, G. ; Colet, P. ; Mirasso, C.R. ; Balle, S., "Bistability and all optical switching in semiconductor ring lasers", *Proceeding of 9th International Conference on Transparent Optical Networks, ICTON*, (2007).
4. Scirè, A; Colet, P; Pérez, Toni; Mirasso, C.R., "All-optical two-mode switching in semiconductor ring lasers", *Proc. SPIE Proceedings*, **6184**, pp. 70-75, (2006).
3. R. Vicente, T. Pérez, Y. Chembo, P. Colet, and C.R. Mirasso, "Performance comparison of different encoding schemes in chaotic optical communication systems", *Quantum Electronics Conference EQEC 03*, pp. 20, (2003).
2. C.R. Mirasso and T. Pérez, "Chaos control and synchronization in diode lasers", *Optical Society of America Meeting, Frontiers in Optics*, (2003).

1. T. Pérez, R. Vicente, C.R. Mirasso and P. Colet, “*Dynamical Entrainment of Unidirectionally Coupled Single-Mode Diode Lasers*”, Physics and Simulation of Optoelectronic Devices X. SPIE Proceedings, **4646**, pp. 479-486, (2002).

#### BOOKS

- Pérez, Toni, “*Dynamics and Synchronization in Neuronal Models*”, Lambert Academic Publishing, Germany, ISBN 978-3-8484-3634-7 (2012).

### Congress Presentations

#### TALKS

- *Synchronization of Neuronal Complex Networks in the presence of delayed interactions*, 06/03/2013, XXXIII Dynamics Days Europe. Madrid (Spain).
- *Synchronization of Neuronal Complex Networks in the presence of delayed interactions*, 07/06/2012, International Conference on Delayed Complex Systems DCS12. Palma de Mallorca (Spain).
- *Relationship between structural and functional networks in complex systems with delay*, 03/25/2011, APS March Meeting. Dallas (USA).
- *Phase clustering of delay-coupled phase oscillators on complex networks*, 02/06/2010, BIFI2010 IV International Conference, Networks: A framework for cross-disciplinary applications. Zaragoza (Spain).
- *Enhancement of neural response by diversity*, 03/18/2010, APS March Meeting 2010, Portland (USA).
- *Effects of the topology and delay in a neuronal network*, 03/26/2009, GABA Workshop 2009, Paris (France).
- *Synchronization of chaotic unidirectionally coupled multisection lasers*, 06/21/2007, CLEO Europe/IQEC 2007, Munich (Germany).
- *Synchronization of chaotic unidirectionally coupled multisection lasers*, 03/30/2007, PHASE IPSSO 2007, Metz (France).
- *Chaos Synchronization of Unidirectionally Coupled Multisection Lasers*, 11/26/2006, Cleo Focus Meeting 2006, Cannes (France).
- *All-Optical Two-modes Switching in Semiconductor Ring Lasers.*, 04/03/2006, Photonics Europe 2006, Strasbourg (France).

#### POSTERS

- *Hierarchical neuronal networks exhibit similar oscillation patterns across different species*, 03/06/2012, ICMS Neurodynamics Workshop, Edinburgh (UK).
- *Hierarchical connectivity provides a structural backbone for distinct species-independent oscillations*, 11/29/2011, UK Neuroinformatics Workshop, Manchester (UK).

- *Effects of the range and strength of interparticle attraction on gelation*, 03/23/2011, APS March Meeting, Dallas (USA).
- *Nucleation Dynamics of Particles with Directional Interactions*, 03/15/2010, APS March Meeting, Portland (USA).
- *Diversity-induced resonance in a FitzHugh-Nagumo neuronal network*, 10/09/2008, Dynamics Days Asia Pacific 5 Nara (Japan).
- *Study of the Role of diversity of Synaptically-Coupled Neurons*, 11/08/2007, Noise in Life 07, Dresden (Germany).
- *Bistability and Optical Switching in Semiconductor Ring Lasers*, 06/20/2007, CLEO Europe/IQEC 2007, Munich (Germany).
- *All-Optical Two-modes Switching in Semiconductor Ring Lasers.*, 09/25/2006, Cleo Focus Meeting 2006, Cannes (France).
- *Optical-Mode Commutation in Semiconductor Ring Lasers*, 06/27/2005, XIII Congreso de Física Estadística (FISES 2005), Madrid (Spain).
- *Synchronization of Chaotic Semiconductor Lasers and its Applications to Optical Communications*, 09/27/2004, XX Trobades científiques de la Mediterranea, Mahon (Spain).

## Miscellanea

### OUTREACH

- 2009      Involved in Modern Optics Days celebrated at IFISC.
- 2007-2008      Active part of the IFISC team participating in the Balearic Islands Science Fair organized in Palma de Mallorca and Ibiza.

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