

# Elena RUFÉIL

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## Personal Information

Birth: 15/08/80.

Place of birth: Argentina.

Civil status: single.

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## Education

**Ph. D. in Physics**, Facultad de Matematica, Astronomia y Fisica (FaMAF), Universidad Nacional de Cordoba (UNC), Argentina, 04/04-11/09. Thesis: “Coherent dynamics of charge and spin excitations in one-dimensional systems”. Advisor: Prof. Dr. Horacio M. Pastawski.

**M. Sc. in Physics**, Facultad de Matematica, Astronomia y Fisica, Universidad Nacional de Cordoba, Argentina, March 1999 - March 2004. Title: “Fermi golden rule and dynamical interference effects in model systems”. Advisor: Prof. Dr. Horacio M. Pastawski. GPA 9,67/10.

## Refereed Publications

- 1) **“Effective one-body dynamics in multiple-quantum NMR experiments”**, *E. Rufeil Fiori, C. M. Sánchez, F. Y. Oliva, H. M. Pastawski, P. R. Levstein, Phys. Rev. A* **79**, 032324 (2009). *Virtual Journal of Nanoscale Science & Technology* **19**, Issue 16, April 2009. *Virtual Journal of Quantum Information* **9**, Issue 4, April 2009. *arXiv:0810.1722*.
- 2) **“Survival Probability of a local excitation in a Non-Markovian environment: Survival Collapse, Zeno and Anti-Zeno effects”**, *E. Rufeil Fiori, H. M. Pastawski, Physica B* **404**, 2812-2815 (2009). *arXiv:0812.1009*.
- 3) **“Survival probability of surface excitation in a 2d lattice: non-Markovian effects and Survival Collapse”**, *E. Rufeil Fiori, H. M. Pastawski, Braz. Journ. of Phys.* **36**, 844-847 (2006). *arXiv:quant-ph/0604069*.
- 4) **“Non-Markovian decay beyond the Fermi Golden Rule: Survival Collapse of the polarization in spin chains”**, *E. Rufeil Fiori, H. M. Pastawski, Chem. Phys. Lett.* **420**, 35-41 (2006). *arXiv: quant-ph/0511176*.

## Submitted Journal Publications

- 1) “A comparison between two edge maps based on the Non-decimated Haar Wavelet: standard thresholding versus 1d Hidden Markov Model”, ***E. Rufeil Fiori, J. Gimenez, G. Flesia. sent to publish to Lecture Notes in Computer Science - LNCS series.***
- 2) “Quality control of image edge maps: a measure of comparison between automatic image edge labeling methods”, ***J. Gimenez, E. Rufeil Fiori, G. Flesia, sent to publish to Lecture Notes in Computer Science - LNCS series.***
- 3) “A Shannon-Tsallis transformation”, ***E. Rufeil Fiori, A. Plastino. Sent to publish to Physica A. arXiv: arXiv:1201.4507***

### Research Experience

- Hidden Markov models, Bayesian nets and Bayesian inference in the framework of *Image processing and classification*.
- *Quantum Dynamics*: Analytical and numerical studies on coherent dynamics of charge and spin excitations in low dimensional systems. Analytical studies of the effect of Markovian and Non-Markovian environments. Analytical and numerical studies of mapping from many-body to one-body dynamics. Numerical studies of injection condition in the Schrödinger equation, temporal reversion, and Loschmidt echo.
- *Nuclear Magnetic Resonance Experiments*: Experiments leading to one-body dynamics using spin chains in crystal powders at room temperature. Multiple quantum coherences dynamics. Studies of decoherence through Loschmidt echo.

### Fellowships and Internships

- Doctoral fellowship of CONICET (National Council of Science and Technology, Argentina) April 2004-2009.
- Internship, National University of Singapore, Singapore. Advisor: Vlatko Vedral. Feb-Mar 2009.
- Internship, Universidade do Estado do Rio de Janeiro, Brasil. Advisor: C. H. Lewenkopf. Feb-Mar 2006.
- Young Collaborator Program fellowship, Abdus-Salam ICTP, Trieste, Italy, Aug-Oct 2004.
- University Prize, Universidad de Córdoba, Honor mention to the best GPA 2004.

### Seminars and Invited Talks

- “Dinámica coherente de excitaciones de carga y espín en sistemas unidimensionales”. *Graduated Thesis. FaMAF-UNC, Córdoba, November 2009. Moderator: Horacio Pastawski.*
- “Effective one-body dynamics in spin chains; coherence, interference and decoherence”. *Talk given at – NUS, Singapore, February 2009. Moderator: Vlatko Vedral.*
- “Qué son las coherencias cuánticas múltiples en NMR?” *Seminar given at FaMAF-UNC, Córdoba, November 2009. Moderator: Horacio Pastawski.*
- “Punto cuántico como bit cuántico” *Seminar given at FaMAF-UNC, Córdoba, October 2009. Moderator: Horacio Pastawski.*

- “Survival probability of a local excitation in a non-Markovian environment: Return effects and Survival collapse” *Talk given at Universidade do Estado do Rio de Janeiro, Brasil, February 2006. Moderator: Caio H. Levenkopff.*

### Participation in conferences

- **“10° Regional Congress of Statistical Physics and Condense Matter Applications ”**, La Falda, Cordoba, Argentina, 20-24 May 2012.
- **“Fluctuations and nonequilibrium systems”**, Santiago de Chile, Chile, 05-10 December 2012. “Effective one-body dynamics in multiple-quantum Nuclear Magnetic Resonance experiments”, E. Rufeil Fiori, C. M. Sanchez, F. Y. Oliva, H. M. Pastawski and P. R. Levstein.
- **“Principles of single molecule biophysics and its applications”**, Santiago de Chile, Chile, 21-25 March 2011.
- **“4° Argentinian school of Mathematics and Biology; BIOMAT 2010”**, La Falda, Córdoba, Argentina, 02-05 August 2010.
- **“At the frontiers of condensed matter IV”**, “Survival Probability of a local excitation in a Non-Markovian environment: Survival Collapse, Zeno and Anti-Zeno effects”, Buenos Aires, Argentina, 9-12 December 2008, E. Rufeil Fiori and H. M. Pastawski.
- **“Quantum Optics IV”**, “Multiple Quantum Coherence and Decoherence in a Restricted Hilbert Space”, Florianopolis, Brasil, 13-17 October 2008, E. Rufeil Fiori, C. M. Sanchez, F. Y. Oliva, H. M. Pastawski and P. R. Levstein.
- **“Mini-School on Disordered Systems 2008 and 6th International Workshop on Disordered System”**, “Multiple Quantum Coherence and Decoherence in a Restricted Hilbert Space”, La Falda, Cordoba, Argentina, 8-12 September 2008, E. Rufeil Fiori, F. Y. Oliva, C. M. Sanchez, H. M. Pastawski and P. R. Levstein.
- **“Applied Optics Meeting”**, “Multiple quantum coherence as detector of one-body one-dimensional dynamics in NMR experiments”, Buenos Aires, Argentina, 29-30 October 2007, E. Rufeil Fiori, F. Oliva, P. R. Levstein, K. Chattab, H. M. Pastawski.
- **“Quantum information School and Workshop Paraty 2007”**, “Multiple quantum coherence as detector of one-body one-dimensional dynamics in NMR experiments”, Paraty, Rio de Janeiro, Brasil, 06-16 August 2007, E. Rufeil Fiori, F. Oliva, P. R. Levstein, H. M. Pastawski. <http://www.paraty07.net/>
- **“Conference on Quantum Phenomena in Confined Dimensions”**, “One dimensional many-body dynamics in spin chains detected through multiple quantum coherence NMR experiments”, Abdus Salam International Centre for Theoretical Physics, Trieste, Italia, 4-8 June 2007, E. Rufeil Fiori, F. Oliva, P. R. Levstein, H. M. Pastawski. [http://cdsagenda5.ictp.it/full\\_display.php?ida=a06199](http://cdsagenda5.ictp.it/full_display.php?ida=a06199)
- **“Magnetic Resonance in a Cordubensis Perspective”** (with R. R. Ernst), “Survival Probability and Multiple Quantum Coherence in 1d spin chain”, Córdoba, Argentina, 30 November and 1st December 2006, E. Rufeil Fiori, F. Oliva, P. R. Levstein, H. M. Pastawski. <http://www.lanais.famaf.unc.edu.ar/cordubensisNMR2006/index.htm>
- **“College on Physics of Nano-Devices”**, “Survival probability of a local excitation in a non-Markovian environment: Return effects and Survival collapse”, Abdus Salam International Centre for Theoretical Physics, Trieste, Italia, July 2006, E. Rufeil Fiori, H. M. Pastawski. [http://cdsagenda5.ictp.it/full\\_display.php?ida=a05212](http://cdsagenda5.ictp.it/full_display.php?ida=a05212)

- **“12° Latin American Congress of Surface Science and its applications”**, “Survival probability of surface excitation in a 2d lattice: non-Markovian effects and Survival Collapse”, Angra dos Reis, Rio de Janeiro, Brasil, December 2005, E. Rufeil Fiori, H. M. Pastawski.
- **“Quantum symposium. Time of Challenges: Harnessing the Uncertainties of the Quantum World”**, “Survival Probability and Survival Collapse in a linear spin chain” Córdoba, Argentina, October 2005. E. Rufeil Fiori, H.M. Pastawski. <http://www.lanais.famaf.unc.edu.ar/QuantumSymposium2005/>

### Attended Courses

- **“History of Physics”**, lecturer: Prof. Walter Lamberti, Facultad de Matematica, Astronomia y Fisica, Universidad Nacional de Cordoba, Cordoba, Argentina, 60 hours.
- **“Mathematics Biology I”**, lecturer: Prof. Carlos Condat, Gustavo Sibona, Facultad de Matematica, Astronomia y Fisica, Universidad Nacional de Cordoba, Cordoba, Argentina, 60 hours.
- **“Nonequilibrium fluctuations in small systems: from physics to biology”**, lecturer: Prof. Dr. Félix Ritort (Universitat de Barcelona, Spain), Facultad de Ciencias Fisicas y Matematicas, Universidad de Chile, Santiago, Chile, 14 hours
- **“4 out of equilibrium lectures”**, lecturer: Prof. Dr. Jorge Kurchan (ESPCI, France), Facultad de Ciencias Fisicas y Matematicas, Universidad de Chile, Santiago, Chile, 14 hours.
- **“Principles of single molecule biophysics and its applications”**, lecturer: Prof. Dr. Carlos Bustamante. Facultad de Ciencias Químicas y Farmacéuticas, Universidad de Chile. 14 hours.
- **“Segmentation using hidden Markov models”**, lecturer: Prof. Dr. Georgina Flesia. Facultad de Matemática, Astronomía y Física, Universidad Nacional de Córdoba, 10/10, 60 hours.
- **“Cellular and Molecular Neurobiology”**, coordinator: Dr. Roberto A. Rovasio. Facultad de Matemática, Astronomía y Física, Universidad Nacional de Córdoba. Calificación: 10/10. 40 hours.
- **“Stochastic Processes”**, lecturer: Dr. Carlos Budde. Facultad de Matemática, Astronomía y Física, Universidad Nacional de Córdoba. 60 hours.
- **“Multiple Quantum Coherence and advance techniques in Nuclear Magnetic Resonance”**, lecturer: Prof. P. R. Levstein, FaMAF, 60 hours.
- **“Introduction to critical phenomena”**, lecturer: Prof. P. Serra en FaMAF, 10/10, 60 hours.
- **“Quantum Computation”**, lecturer: Prof. H. M. Pastawski, FaMAF, 10/10, 60 hours.
- **“Average Hamiltonians and Floquet Theory in Nuclear Magnetic Resonance: Theory and Applications”**, lecturer: Prof. P. R. Levstein and H. M. Pastawski, FaMAF, 10/10, 60 hours.
- **“Molecular Electronic”**, lecturer: Prof. H. M. Pastawski, FaMAF, 10/10, 60 hours.
- **“Chaos y Non-linear Dynamics”** Prod.: Universidad Politécnica de Madrid, Prof. Inv.: H. M. Pastawski, UNC, 10 hours.

### Languages

- *Spanish*, mother tongue.
- *English*, average (written, oral), good (read, listening).
- *Portuguese*, average reading, listening and spoken.

## Teaching Experience

- 2003 FaMAF - UNC - Teacher Assistant.  
1st. Semester: Laboratorio de Física General II - General Physics (Laboratory courses), Introduction to Thermodynamics.  
2nd. Semester: Métodos Matemáticos de la Física, Mathematical Methods of Physics (Problems).
- 2004 FaMAF - UNC - Teacher Assistant  
1st. Semester: Física Moderna II (Problems), Introduction to Condense Matter Physics.
- 2005 FaMAF - UNC - Teacher Assistant  
1st. Semester: Introducción a la Física - General Physics (Problems), Introduction to Newtonian Physics.  
2nd. Semester: Física Moderna I (Problems), Introduction to Quantum Physics.
- 2006 FaMAF - UNC - Teacher Assistant  
1st. Semester: Introducción a la Física - General Physics (Problems), Introduction to Newtonian Physics.
- 2007 FaMAF - UNC - Teacher Assistant  
1st. Semester: Introducción a la Física - General Physics (Problems), Introduction to Newtonian Physics.  
2nd. Semester: Física General I - General Physics (Problems), Newtonian Physics.
- 2008 FaMAF - UNC - Teacher Assistant  
1st. Semester: Física General IV - General Physics (Problems), Classical optics.
- 2009 FaMAF - UNC - Teacher Assistant  
1st. Semester: Laboratorio de Física General IV - General Physics (Laboratory courses), Classical optics.  
2nd. Semester: Laboratorio de Física General I, - General Physics (Laboratory courses), Newtonian Mechanics.
- 2010 FaMAF - UNC - Teacher Assistant  
Summer course: Cursillo de Ingreso – Preparatory Course for the physics, mathematics, astronomy and computation sciences carrer at FaMAF.  
1st. Semester: Laboratorio de Física General IV – General Physics (Laboratory courses), Classical optics.  
Winter Course: Informatics course for high school students.  
Winter Course: Informatics course for retired persons.  
2nd. Semester: Física II para Ciencias Químicas – General Physics at the Faculty: Chemistry Sciences; Classical optics, Electrostatic and principles of electrical engineering.
- 2011 FaMAF - UNC- Teacher Assistant  
1st Semester: Thermodynamics (Problems)  
2nd Semester: Calculus II (Problems)
- 2012 FaMAF - UNC- Teacher Assistant  
1st Semester: Thermodynamics (Problems)  
2nd Semester: Statistical Mechanics (Problems)