

CURRICULUM VITAE

Marcel Guardia

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Birthdate: October 2, 1982
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Employment

- ◇ **Brin Postdoctoral Fellow. University of Maryland at College Park**, Maryland, United States. From June 2012 to present.
- ◇ **Member. Institute For Advanced Study**, Princeton, New Jersey, United States. Spring 2012.
- ◇ **Brin Postdoctoral Fellow. University of Maryland at College Park**, Maryland, United States. Fall 2011.
- ◇ **Postdoctoral Fellow. Fields Institute (University of Toronto)**, Toronto, Canada. Spring 2011.
- ◇ **Research Associate. Pennsylvania State University**, State College, United States. Fall 2010.
- ◇ Teaching Assistant (Calculus I). Departament de Matemàtica Aplicada I, Universitat Politècnica de Catalunya, Barcelona, Spain. Fall 2005.

Education

- ◇ **Ph.D. Universitat Politècnica de Catalunya (UPC)**, Spain. Barcelona 2005 – 2010.
Thesis: “From non-smooth to analytic Dynamical Systems: low codimension bifurcations and exponentially small splitting of separatrices”. Advisor: Teresa Martínez-Seara Alonso.
- ◇ **Universitat Politècnica de Catalunya (UPC)**, Spain. Barcelona 2007. Diploma d’Estudios Avanzados (Master of Philosophy in Applied Maths)

- ◇ **Universitat Politècnica de Catalunya (UPC)**, Spain. Barcelona 2000 – 2005. Bachelor in Mathematics (Licenciatura: 5-year degree). Rank: 3rd out of 40.
- ◇ **Universitat Politècnica de Catalunya (UPC)**, Spain. Barcelona 2005. Certificate for Teaching Habilities (Certificat d’Aptitud Pedagògica).
- ◇ **IES Costa i Llobera (High School)**. Barcelona, 1997 - 2000.

Scholarships

- ◇ Doctorate Fellowship of the Government of Spain (04/2005 to 12/2009).
- ◇ Doctorate Fellowship of the Government of Catalonia (01/2005 to 03/2005).
- ◇ Scholarship awarded by Facultat de Matemàtiques at Universitat Politècnica de Catalunya, Barcelona, Spain. Collaboration in Teaching Activities (09/2001-06/2005).

Publications

- M. Guardia, C. Olivé, T. Seara. “Exponentially small splitting for the pendulum: a classical problem revisited”, *Journal of Nonlinear Science*, 20: 595-685, (2010).
- M. Guardia, S.J. Hogan, T. Seara. “An analytical approach to codimension 2 sliding bifurcations in the dry friction oscillator”, *SIAM Journal on Applied Dynamical Systems*, 9: 769–798 (2010).
- M. Guardia, T. Seara, M. A. Teixeira. “Generic bifurcations of low codimension of planar Filippov Systems”, *Journal of Differential Equations*, 250 (4): 1967-2023 (2010).
- M. Guardia, T. Seara. “Exponentially and non-exponentially small splitting of separatrices for the pendulum with a fast meromorphic perturbation”, *Nonlinearity*, 24 (5): 1367-1412 (2012)
- M. Guardia. “Exponentially small splitting for nearly integrable Hamiltonian Systems of one and a half degrees of freedom close to a resonance”, to appear in *Discrete and Continuous Dynamical Systems A*.

Preprints

- I. Baldomá, E. Fontich, M. Guardia, T. Seara. “Exponentially small splitting of separatrices beyond Melnikov analysis: rigorous results”, submitted. Available at <http://arxiv.org/abs/1201.5152>.
- J. Féjoz, M. Guardia, V. Kaloshin, P. Roldán. “Diffusion along mean motion resonance in the restricted planar three-body problem ”, submitted. Available at <http://arxiv.org/abs/1109.2892>.
- M. Guardia, V. Kaloshin. “Growth of Sobolev norms in the cubic defocusing nonlinear Schrödinger equation”, submitted. Available at <http://arxiv.org/abs/1205.5188>.
- M. Guardia, P. Martin, T. Seara. “Oscillatory motions for the restricted planar circular three body problem”, to be submitted soon.

Contributions to National and International Meetings

- ◇ **Nonlinear Hamiltonian PDEs.** July 1-6, 2012, Centro Stefano Franscini (Swiss federal institute Zurich), Ascona, Switzerland. Contributed Talk: *Growth of Sobolev norms for the cubic defocusing nonlinear Schrodinger equation*, joint work with Prof. V. Kaloshin.
- ◇ **Workshop on Symplectic Dynamics II.** March 12-16, 2011, Institute for Advanced Study, Princeton, New Jersey. Plenary Talk: *Growth of Sobolev norms for the cubic defocusing nonlinear Schrödinger equation in polynomial time*, joint work with Prof. V. Kaloshin.
- ◇ **Nanjing Conference on Hamiltonian Dynamics 2011.** August 21-28, 2011, Nanjing, China. Plenary Talk: *An instability mechanism along the mean motion resonances in the restricted three body problem*, joint work with Prof. J. Féjoz, V. Kaloshin and P. Roldán.
- ◇ **Equadiff 11.** August 1-5, 2011, Loughborough, United Kingdom. Invited Talk: *Exponentially small splitting of separatrices for the pendulum with fast periodic or quasiperiodic meromorphic perturbation*, joint work with Prof. Tere M. Seara.
- ◇ **Workshop on Instabilities in Hamiltonian Systems.** June 13-17, 2011, Toronto, Canada. Plenary Talk: *Diffusion*

along mean motion resonances in the restricted three body problem, joint work with Prof. J. Féjoz, V. Kaloshin and P. Roldán.

- ◇ **Workshop in Dynamical Systems and Related Topics.** October 21-24, 2010, State College, Pennsylvania, United States. Oral Communication: *An asymptotic formula for the splitting of separatrices of nearly integrable Hamiltonian Systems of one and a half degrees of freedom close to a resonance.*
- ◇ **Emerging Topics in Dynamical Systems and Partial Differential Equations DSPDEs'10.** May 31- June 4, 2010, Barcelona, Spain. Invited Talk: *Exponentially small splitting of separatrices for a one degree hamiltonian with a non-autonomous fast and periodic perturbation*, joint work with Profs. I. Baldomá, Er. Fontich and T. M. Seara.
- ◇ **8th AIMS Conference on Dynamical Systems, Differential Equations and Applications.** May 25-28, 2010, Dresden, Germany. Oral Communication: *Exponentially small splitting of separatrices for the pendulum with a fast periodic meromorphic perturbation*, joint work with Prof. T. M. Seara.
- ◇ **Conference on Celestial Mechanics at the University of Maryland.** April 15-18, 2010, College Park, Maryland, United States. Oral Communication: *Exponentially small splitting of separatrices for one and a half degrees of freedom Hamiltonian Systems close to a resonance.*
- ◇ **International Workshop on Resonance Oscillations and Stability of Nonsmooth Systems.** June 16-25, 2009, London, United Kingdom. Oral Communication: *Codimension-2 singularities with infinitely many codimension-1 bifurcation branches*, joint work with Profs. T. M. Seara and M. A. Teixeira.
- ◇ **SIAM Conference on Applications of Dynamical Systems.** May 17-21, 2009, Snowbird (Utah), United States. Invited Talk: *Global Phenomena in a Neighborhood of Codimension-2 Local Singularities of Planar Filippov System*, joint work with Profs. T. M. Seara and M. A. Teixeira.
- ◇ **Problems in nonsmooth Dynamical Systems.** June 28-29, 2008, Bristol, United Kingdom. Invited Talk: *Topological equivalences for planar Filippov Systems*, joint work with Profs. T. M. Seara and M. A. Teixeira.
- ◇ **Nolineal08.** June 16-19, 2008, Barcelona, Spain. Oral Communication: *Discontinuity induced bifurcations of periodic orbits in Filippov Systems*, joint work with Profs. John Hogan and Tere M. Seara.

- ◇ **50th British Applied Mathematics Colloquium.** March 31 - April 03, 2008, Manchester, United Kingdom. Invited Talk: *Generic bifurcations of planar Filippov vector fields by topological equivalence*, joint work with Profs. Marco Antonio Teixeira and Tere M. Seara. Invited talk to the minisymposium “Non Smooth Dynamical Systems”.
- ◇ **International Conference on Dynamical Methods and Mathematical Modeling.** September 18-22, 2007, Valladolid, Spain. Oral Communication: *Bifurcation of sliding periodic orbits for a discontinuous model of the dry friction oscillator*, joint work with Profs. John Hogan and Tere M. Seara.
- ◇ **Equadiff 07.** August 5-10, 2007, Vienna, Austria. Invited Talk: *Exponentially small splitting of the rapidly forced pendulum via Hamilton-Jacobi equation and Resurgence: a proof of the singular case*, joint work with Profs. Carme Olivé and Tere M. Seara.
- ◇ **Chaos, Complexity and Transport: Theory and Applications.** June 4-8, 2007, Marseille, France. Poster: *Splitting of separatrices for the periodically rapidly forced pendulum*, joint work with Profs. Carme Olivé and Tere M. Seara.

Invited talks at Seminars

- ◇ *Growth of Sobolev norms for the cubic defocusing nonlinear Schrodinger equation in polynomial time.* Universitat de Barcelona – Universitat Politècnica de Catalunya Dynamical Systems Seminar, Barcelona, Spain. June 27, 2012.
- ◇ *Growth of Sobolev norms for the cubic defocusing nonlinear Schrodinger equation in polynomial time.* New York University Analysis Seminar, New York, United States. April 19, 2012.
- ◇ *Growth of Sobolev norms for the cubic defocusing nonlinear Schrodinger equation in polynomial time.* Princeton University Analysis Seminar, Princeton, New Jersey, United States. April 9, 2012.
- ◇ *An instability mechanism along the mean motion resonances in the restricted three body problem.* Institute for Advanced Study Working Group on Symplectic Dynamics, Princeton, New Jersey, United States. March 21, 2012.
- ◇ *Growth of Sobolev norms for the cubic defocusing nonlinear Schrodinger equation in polynomial time.* University of Maryland PDE/Applied Math Seminar, College Park, Maryland, United States. March 8, 2012.

- ◇ *An instability mechanism along the mean motion resonances in the restricted three body problem.* GeorgiaTech CDSNS Colloquium, Atlanta, Georgia, United States. January 9, 2012.
- ◇ *Exponentially small splitting of separatrices for one and a half degrees of freedom Hamiltonian Systems close to a resonance.* McMaster University PDE/Analysis Systems Seminar, Hamilton, Ontario, Canada. April 15, 2011.
- ◇ *Exponentially small splitting of separatrices for $1\frac{1}{2}$ degrees of freedom Hamiltonian Systems close to a resonance.* University of Toronto Dynamical Systems Seminar, Toronto, Ontario, Canada. March 7, 2011.
- ◇ *Analytic properties of one and a half degrees of freedom Hamiltonian Systems and exponentially small splitting of separatrices.* University of Maryland Dynamical Systems Seminar, College Park, Maryland, United States. November 18, 2010.
- ◇ *On dependence on the order of the perturbation of the exponentially small splitting of separatrices.* Penn State University, Center for Dynamics and Geometry Seminar, State College, Pennsylvania, United States. November 8, 2010.
- ◇ *Exponentially small splitting of separatrices of the pendulum: two different examples.* Universitat de Barcelona and Universitat Politècnica de Catalunya Dynamical Systems Seminar, Barcelona, Spain. July 8, 2009.
- ◇ *Exponentially small splitting of separatrices for several rapid periodic perturbations of the pendulum.* Center for Dynamics and Geometry Seminar at Pennsylvania State University, State College (Pennsylvania), United States. March 2, 2009.
- ◇ *Exponentially small splitting of separatrices for the rapidly forced pendulum .* Student Dynamics Seminar at University of Maryland, College Park (Maryland). October 7, 2008
- ◇ *Splitting of separatrices for Hamiltonian Systems with a fast perturbation.* Working Dynamical Systems Seminar at Pontifícia Universidade Católica do Rio de Janeiro, Rio do Janeiro. December 7, 2007.
- ◇ *Un ejemplo de no validez de la teoría de Melnikov para la escisión de separatrices exponencialmente pequeña: el péndulo forzado periódica y rápidamente.* Working Dynamical Systems Seminar at Universidade Estadual Paulista, São José do Rio Preto, São Paulo, Brasil. November 29, 2007.

Research Visits

- ◇ Departament of Mathematics at GeorgiaTech, Atlanta (Georgia), United States (1/7/2012 - 1/18/2012). Related topic: Spatial instabilities in elliptic PDEs.
- ◇ Departament of Mathematics at University of Maryland, College Park (Maryland), United States (3/2/2010 - 11/05/2010). Related topic: Arnol'd Diffusion in the Restricted Planar Elliptic Three Body Problem.
- ◇ Departament of Mathematics at Pennsylvania State University, State College (Pennsylvania), United States (16/2/2009 - 6/2/2009). Related topic: Exponentially small splitting of separatrices in the Restricted Elliptic Planar and Spatial Circular Three Body Problems.
- ◇ Departament of Mathematics at University of Maryland, College Park (Maryland), United States (8/8/2008 - 25/11/2008). Related topic: Exponentially small splitting of separatrices in the Restricted Planar Three Body Problem.
- ◇ Departamento de Matematica at Universidade Estadual de Campinas (Unicamp), Campinas, Brasil (13/10/2007 - 13/12/2007). Related topic: Local bifurcations in non-smooth Dynamical Systems.
- ◇ Department of Engineering Mathematics at University of Bristol, Bristol, UK (20/9/2006 - 20/12/2006). Related topic: Non-smooth Dynamical Systems.

Teaching experience

- ◇ Calculus, Fall 2010. Department of Mathematics, Penn State University, State College, Pennsylvania, United States.
- ◇ Course Calculus II for first year students in Chemistry and Industrial Engineering, 02/2009 - 6/2009. Departament de Matemàtica Aplicada I, Universitat Politècnica de Catalunya, Barcelona, Spain.
- ◇ Course Calculus II for first year students in Industrial Engineering, 02/2008 - 6/2008. Departament de Matemàtica Aplicada I, Universitat Politècnica de Catalunya, Barcelona, Spain.
- ◇ Course Calculus I for first year students in Industrial Engineering, 09/2005 - 12/2005. Departament de Matemàtica Aplicada I, Universitat Politècnica de Catalunya, Barcelona, Spain.

Seminars and conferences attended

- ◇ **Recent Trends in Non Linear Science.** Carmona (Sevilla), February 2009. Courses taught by J. Hogan, E. Pujals and F. Dumortier.
- ◇ **Introduction to Dynamical Systems and Partial Differential Equations.** Barcelona, Spain, March 2008. Organized by Teresa Martínez-Seara and taught by M. A. Teixeira and J. L. Vázquez.
- ◇ **Recent Trends in Non Linear Science.** Cullera (València), February 2008. Courses taught by R. de la Llave, K.-G. Grosse-Erdmann and M. Lyubich.
- ◇ **NATO's Advanced Study Institute: Hamiltonian Dynamical Systems and applications.** Département de Mathématiques, Université de Montréal. Montreal, Canada, June 2007.
- ◇ **Introduction to Dynamical Systems and Partial Differential Equations.** Barcelona, Spain, June 2007. Organized by Teresa Martínez-Seara and taught by V. Kaloshin, R. de la Llave and D. Bambusi.
- ◇ **Recent Trends in Non Linear Science.** Granada, February 2007. Courses taught by C. Chicone, R. Johnson and E. Fossas.
- ◇ **Semi-classical Long-time Evolution: Part II.** Wolfgang Pauli Institute, Vienna, Austria. Organized by Thierry Paul and Rafael de la Llave and taught by T. Paul, R. de la Llave, T. M. Seara and C. Simó.
- ◇ **Dynamical Days 2006**, meeting of the network DANCE, held in Sevilla (Spain) during October, 2006.
- ◇ **Semi-classical Long-time Evolution: Part I.** Wolfgang Pauli Institute, Vienna, Austria. Organized by Thierry Paul and Rafael de la Llave and taught by T. Paul, R. de la Llave, F. Borondo, R. M. Benito, B. Doucot.
- ◇ **Introduction to Dynamical Systems and Partial Differential Equations.** Barcelona, Spain, June and July 2006. Organized by Teresa Martínez-Seara and taught by J. Hogan, M. di Bernardo, M. degli Esposti, H. Matano, E. Wayne and F. Hamel.
- ◇ **Carles Simó Fest.** S'Agaró, Spain, 29 May - 3 June 2006. Conference focused on recent relevant results in the study of Dynamical Systems.

- ◇ **Recent Trends in Non Linear Science.** Gijón, February 2006. Courses taught by E. Titi, Sh.-N. Chow, J. Mallet-Paret and R. Ortega.
- ◇ **Dynamical Systems Seminar** Organized by Universitat de Barcelona and Universitat Politècnica de Catalunya. Regular assistance during the last years.
<http://maia.ub.es/ssd>

Participation in funded research projects

- *Dinámica asociada a Conexiones Invariantes, Astrodinámica y otras aplicaciones.* Research project funded by Spanish Science Department from 2007 to 2009. Leading researcher: Amadeu Delshams.
- *Dinámica asociada a Conexiones Invariantes, Astrodinámica, Neurociencia y otras aplicaciones.* Research project funded by Spanish Science Department from 2010 to 2012. Leading researcher: Amadeu Delshams.
- *SGR 2010 sd-UPC.* Research project funded by Catalan Science Department from 2010 to 2014. Leading researcher: Amadeu Delshams.

Language Skills

- ◇ **English:** Fluently spoken/written. Cambridge Certificate in Advanced English passed in 2001.
- ◇ **German:** Conversation level. Zertifikat Deutsch als Fremdsprache passed in 2005
- ◇ **French:** Conversation level.
- ◇ **Spanish and Catalan:** Native language fluency.

Additional Information

- ◇ **Introduction to Dynamical Systems and Chaos:** Followed the graduate course given by Dr. Carles Simó and Dr. Nuria Fagella (Fall 2005).
- ◇ **Quantitative and qualitative methods in Dynamical Systems:** Followed the graduate course given by Dr. Amadeu Delshams and Dr. Pere Gutierrez (Spring 2005).

- ◇ **Asymptotics methods in Dynamical Systems:** Followed the graduate course given by Dr. Teresa Martínez-Seara (Fall 2005).
- ◇ **Simulation Methods:** Followed the graduate course given by Dr. David Gómez-Ullate and Joaquim Puig (Spring 2006).
- ◇ **Functional Analysis:** Followed the graduate course given by Dr. Xavier Cabré (Spring 2006).
- ◇ **Non linear control methods:** Followed the graduate course given by Dr. Enric Fossas (Fall 2005).