

Renato C. Calleja

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Department of Mathematics and Mechanics
Instituto de Investigaciones en Matemáticas Aplicadas y en Sistemas (IIMAS),
Universidad Nacional Autónoma de México (UNAM),
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Education

- Ph.D. *Mathematics*
University of Texas at Austin
August 2004 - May 2009
Advisor: Rafael de la Llave
Thesis: *Existence and persistence of invariant objects in dynamical systems and mathematical physics*¹
- B.S. *Applied Mathematics* (honors)
Instituto Tecnológico Autónomo de México
August 1999 - June 2004
Advisor: Héctor E. Lomelí
Thesis: *Symplectic dynamics and numerical approximations of separatrices and chaotic transport*

Research Interests

Dynamical Systems Appearing in Physics and Applied Mathematics

Ordinary Differential Equations, Kolmogorov-Arnold-Moser (KAM) Theory, Numerical KAM Theory, Bifurcation Theory, Non-linear Lattice Equations, Numerical Analysis, Partial Differential Equations, State-Dependent Delay Differential Equations, Hyperbolicity.

¹Frank Gerth III Dissertation Award

Employment

- Investigador Titular “A” (Research Associate Professor)
September 2017 to present, Department of Mathematics and Mechanics,
IIMAS–UNAM
Mexico City, Mexico
- Investigador Asociado “C” (Research Assistant Professor)
August 2013 to September 2017, Department of Mathematics and Mechanics,
IIMAS–UNAM
Mexico City, Mexico
- *Adjunct Professor*
November 2015 to present, Department of Mathematics and Statistics, McGill
University
Montreal, Canada
- *Visiting Professor*
January 2015 - May 2015, Department of Mathematics and Statistics, McGill
University
Montreal, Canada
- *Lluís Santaló Visiting Professor*
June 2014 - July 2014, Centre de Recerca Matemàtica - Universitat de Barcelona
Barcelona, Spain
- *Visiting Assistant Professor*
January 2013 - May 2013, School of Mathematics, Georgia Institute of Technology
Atlanta, USA
- *Postdoctoral Fellow*
September 2012 - December 2012, Institute for Mathematics and its Applications,
University of Minnesota
Minneapolis, USA
- *Postdoctoral Fellow*
August 2009 - August 2012, McGill University, Concordia University, and Centre de
Recherches Mathématiques
Supervisors: Eusebius Doedel and Antony R. Humphries
Montreal, Canada
- *Visiting Researcher*
September 2008 - December 2008, Centre de Recerca Matemàtica
Barcelona, Spain
- *Graduate Research Assistant*
Summer 2006, 2007, & 2008, The University of Texas at Austin
Austin, USA

- *Teacher Assistant*
August 2004 - May 2009, The University of Texas at Austin
Austin, USA

Publications

- 1) Renato C. Calleja, Alessandra Celletti, Rafael de la Llave, *Domains of analyticity of Lindstedt expansions of KAM tori in dissipative perturbations of Hamiltonian systems*, Nonlinearity 30, (2017) 3151-3202
- 2) R. C. Calleja, A. R. Humphries and B. Krauskopf, *Resonance phenomena in a scalar delay differential equation with two state-dependent delays*, SIAM J. Appl. Dyn. Syst., 16(3), 14741513
- 3) R. Calleja, D. del-Castillo-Negrete, D. Martnez-del-Ro, and A. Olvera, *Global transport in a nonautonomous standard map*, Volume 51, October 2017, Pages 198215
- 4) Renato C. Calleja, Alessandra Celletti, Livia Corsi, Rafael de la Llave, *Response solutions for quasi-periodically forced, dissipative wave equations*, SIAM J. Math. Anal., 49(4), 31613207 (2017)
- 5) Renato Calleja, Eusebius Doedel, and Carlos García-Azpeitia, *Symmetry-breaking for a restricted n -body problem in the Maxwell-ring configuration*, Eur. Phys. J. Special Topics 225, 2741-2750 (2016)
- 6) Antony R. Humphries, Daniel A. Bernucci, Renato Calleja, Namdar Homayounfar, Michael Snarski, *Periodic Solutions of a Singularly Perturbed Delay Differential Equation With Two State-Dependent Delays*, J. Dynam. Differential Equations (2016), Volume 28, Issue 3, pp 1215–1263
- 7) David Martnez, Diego del-Castillo-Negrete, Arturo Olvera, Renato Calleja, *Dynamics of a high-dimensional self-consistent transport map model*, Qualitative Theory of Dynamical Systems (2015), Volume 14, Issue 2, pp 313-335
- 8) Renato Calleja, Alessandra Celletti, Corrado Falcolini y Rafael de la Llave, *An Extension of Greene's Criterion for Conformally Symplectic Systems and a Partial Justification*, SIAM J. Math. Anal. 46 (2014), no. 4, 23502384.
- 9) Renato Calleja, Alessandra Celletti, & Rafael de la Llave, *Local behavior near quasi-periodic solutions of conformally symplectic systems*, J. Dynam. Differential Equations 25 (2013), no. 3, 821-841
- 10) Renato Calleja, Alessandra Celletti, & Rafael de la Llave, *KAM theory for conformally symplectic systems: Efficient algorithms and their validation*, J. Differential Equations 255 (2013), no. 5, 978-1049
- 11) Renato Calleja, Alessandra Celletti, & Rafael de la Llave, *Construction of response functions in forced strongly dissipative systems*, DCDS-A (2013), Vol. 33, no. 10

- 12) Renato Calleja & Jordi-Lluís Figueras, *Collision of invariant bundles of quasi-periodic attractors in the dissipative standard map*, Chaos 23, 021203 (2012)
- 13) Renato Calleja, Eusebius Doedel, Antony R. Humphries, Alexandra Lemus-Rodriguez, & Bart Oldeman, *Boundary-value problem formulations for computing invariant manifolds and connecting orbits in the restricted three body problem*, Celestial Mechanics and Dynamical Astronomy, Volume 114, Issue 1-2, pp 77-106
- 14) Renato Calleja & Rafael de la Llave, *Computation of the breakdown of analyticity in statistical mechanics models: numerical results and a renormalization group explanation*, Journal of Statistical Physics (2010) 141:940-951
- 15) Renato Calleja & Rafael de la Llave, *A numerically accessible criterion for the breakdown of quasi-periodic solutions and its rigorous justification*, Nonlinearity 23, (2010) 2029-2058
- 16) Renato Calleja & Alessandra Celletti, *Breakdown of invariant attractors for the dissipative standard map*, Chaos 20 0131 21 (2010)
- 17) Renato Calleja & Yannick Sire, *Travelling waves in discrete nonlinear systems with non-nearest neighbor interactions*, Nonlinearity 22, (2009) 2583-2605²
- 18) Renato Calleja & Rafael de la Llave, *Fast numerical computation of quasi-periodic equilibrium states in 1-D statistical mechanics models, including twist maps*, Nonlinearity 22, (2009) 1311-1336³
- 19) Héctor E. Lomelí & Renato Calleja, *Heteroclinic bifurcations and chaotic transport in the two-harmonic Standard Map*, Chaos 16, 0231 17 (2006)

Preprints

- Pp1) R. Calleja, E. Doedel, and C. Garca-Azpeitia, *Symmetries and choreographies in families that bifurcate from the polygonal relative equilibrium of the n-body problem*, submitted for publication. Preprint available at the ArXiv: <http://arxiv.org/abs/1702.03990>
- Pp2) R. Calleja, E. Doedel, and C. Garca-Azpeitia, *Periodic and Connecting Orbits for the Restricted N-body Problem in the Maxwell-Ring Configuration*.

Research Projects Participation

- Project *Calculus of barriers to global transport in non autonomous maps* (Associate Investigator)

²One of the most read papers in Nonlinearity as of 2009

³One of the most cited papers in Nonlinearity as of 2009

DGAPA-UNAM, PAPIIT-Program, Grant: IN 104514, (Principal investigator: Arturo Olvera)
January 2017-December 2017.

- Project *Chaotic transport and dynamical systems* (Associate Investigator)
DGAPA-UNAM, PAPIIT-Program, Grant: IN 104514, (Principal investigator: Arturo Olvera)
January 2014-December 2014.
- Project *Chaotic transport and dynamical systems II* (Associate investigator)
DGAPA-UNAM, PAPIIT-Program , Grant: IN 104514-2 , (Principal investigator: Arturo Olvera)
January 2015-December 2015.
- Group Project *Non-linear Mathematics in Physics and Engineering III* (Associate Investigator)
CONACYT 133036 (Principal Investigator: Antonmaría Minzoni)
January 2012-December 2016, (Member since: 2013).

Awards and Fellowships

- *Sistema Nacional de Investigadores (Mexico)*
SNI-Conacyt, Level I
January 2013 to present
- *Lluís Santaló Visiting Professor Fellowship*
Institut d'Estudis Catalans and Centre de Recerca Matemàtica
June - July 2015.
- *Postdoctoral Fellowships*
 - McGill University, Concordia University, and Centre de Recherches Mathématiques
September 2009 - August 2010. September 2011- August 2012.
 - Programme de Bourses d'Excellence pour Étudiants Étrangers (PBEEE)
Fonds de recherche du Québec – Nature et technologies (FQRNT)
Hosted by McGill University
September 2010 - August 2011, \$35,000 CAD
- *Frank Gerth III Dissertation Award*
Department of Mathematics, University of Texas at Austin
May 2009.
- *E.D. Farmer Fellowship*
The Mexican Center, University of Texas at Austin
September 2007 - May 2008.

- *Burton Fellowship*
Department of Mathematics, University of Texas at Austin
September 2004 - May 2005.
- *Regents Scholarship*
Department of Mathematics, University of Texas at Austin
May 2005.

Teaching

- *University of Texas at Austin*
Teaching Assistant, Department of Mathematics
 - Calculus I, Fall 2004
 - Real Analysis I, Spring 2005
 - Advance Calculus for Applications I, Fall 2005 and 2006, Spring 2006 & 2008
 - Probability I, Spring 2007
 - Elementary Methods in Statistics, Fall 2007
 - Introduction to Mathematics, Spring 2009
- *McGill University*
Course instructor, Department of Mathematics and Statistics
 - Nonlinear Dynamics and Chaos, Fall 2009 & 2011
 - Honors Nonlinear Dynamics, Fall 2009 & 2011
 - Ordinary Differential Equations for Engineers, Fall 2010
 - Advanced Calculus for Engineers, Winter 2015
- *Georgia Institute of Technology*
Course instructor, School of mathematics
 - Differential Equations, Spring 2013
- *UNAM*
Course instructor, Posgrado en Ciencias Matemáticas (Graduate Program in Mathematics)
 - Selected topics of Analytic Mechanics (Symplectic Geometry and KAM Theory), Spring 2014
 - Ordinary Differential Equations, Fall 2014 and Fall 2015
 - Delay Differential Equations, Fall 2016
 Course instructor, Facultad de Ciencias (School of Sciences)
 - Ordinary Differential Equations I, Spring 2016 and 2017
 - Ordinary Differential Equations I, Fall 2017

Students Supervised

- Department of Mathematics and Statistics, McGill University
 - *Robert Gibson*
Numerical Analysis of Wave Maps (co-supervised with Gantumur Tsogtgerel), B.Sc.
Summer 2010
 - *Namdar Homayounfar*
Numerical Analysis of a State-Dependent Delay Equation close to a singular limit. (co-supervised with Antony R. Humphries), undergraduate
Summer & Fall 2011
 - *Nicolas Gonzalez-Boileau*
Numerical Analysis of a State-Dependent Delay Equation with two independent state dependent delay. (co-supervised with Antony R. Humphries), B.Sc.
Summer 2012
- IIMAS, UNAM
 - *Miguel Angel Cadena*
Resonancias espin-órbita en cuerpos celestes (Spanish), B.Sc., Spring 2015.
Graduated on February 20th, 2015.
 - *Adrián Pérez Bustamante*
Singular limit of small dissipation in celestial mechanics models, M.Sc., Spring 2016
Graduated on June 30th, 2016.
- Current students supervised at IIMAS, UNAM
 - *Andrés Nieto Guadarrama*
Epidemiological models with delays M.Sc. Ongoing
 - *Nicolas Gonzalez-Boileau*
Computation of invariant tori in spin-orbit models, M.Sc. Ongoing
 - *Edgar Rodriguez*
Bifurcation theory in infinite dimensional dynamical systems, M.Sc., PhD
Ongoing

Student Committee Participation

PhD

Marta Canadell Cano
Francisco Martínez Farías
Eduardo Iván Velázquez Richards
David Martínez del Río
Jorge Pérez Hernández

Israel Ramos García
Juliho Castillo Colmenares

Masters

Eduardo Iván Velázquez Richards
Alejandro Bravo Doddoli

Undergraduate

Adrián Pérez Bustamante
Andrés Nieto Guadarrama
Edgar Itamar Avalos Almanza
Carlos Rodolfo Barrera Anselmo

Course and Conference Organization

- Mini-symposium, *Oscillatory Dynamics in Delay Differential Equations*
Conference on the Applications of Dynamical Systems, SIAM
Snowbird, USA. May 25th, 2011
- Graduate Course Organization, *An Introduction to Numerical Continuation Methods with Applications*
Course taught by Prof. Eusebius Doedel
IIMAS-UNAM, July 28th - August 1st, 2014
<http://www.fenomec.unam.mx/curso2014/>
- Scientific Committee, *Interinstitutional Colloquium of Analysis and its Applications*,
IIMAS - Institute of Mathematics - School of Sciences (UNAM), August 2015 to present
- Colloquium Organization, *Applied Mathematics Colloquium* Department of
Mathematics and Mechanics
IIMAS-UNAM, January 2016 - present date
<http://uxmym1.iimas.unam.mx/coloquio/index.html>
- Mini-symposium, *Dynamics, from Theory to Computation*
Dynamics Days Latin America and the Caribbean
Puebla, Mexico, October 24 - November 01, 2016
- Scientific Session *Finite and Infinite Dimensional Hamiltonian Systems*
Mathematical Congress of the Americas
Montreal, Canada, July 24-28, 2017

Arbitraje en revistas indizadas

Boletín de la Sociedad Matemática Mexicana
Celestial Mechanics and Dynamical Astronomy

Communications in Nonlinear Science and Numerical Simulations

Communications on Pure and Applied Analysis

Discrete and Continuous Dynamical Systems

European Physics Journal

Journal of Engineering Mathematics

Journal of Mathematical Physics

Journal of Nonlinear Science

Journal of Physics A

Journal of Statistical Physics

SIAM Journal of Applied Dynamical Systems

SIAM Journal of Mathematical Analysis

Recent Conference and Seminar Talks

- *Invited Talks in Conferences*

- “Mathematical Congress of the Americas”, Canada, July 28th, 2017.
- “Pacific Rim Mathematical Association (PRIMA 2017)”, Mexico, August 13th, 2017
- “CEDYA-CMA”, Spain, June 29th, 2017.
- “V Iberoamerican meeting on Geometry, Mechanics and Control”, Spain, January 20th, 2017.
- AIMS’ 11th International Conference on Dyn. Systems, Diff. Equations and Applications. Orlando, USA. Two talks: July 2nd and 4th 2016
- “Encuentro Nacional de Jovenes Investigadores en Matematicas”, Mexico, Mexico, December, 2015.
- “X Americas Conference on Differential Equations and Nonlinear Analysis”, Buenos Aires, Argentina, February, 2015.
- “AIMS’ 10th International Conference on Dyn. Systems, Diff. Equations and Applications”, Madrid, Spain, July, 2014
- Conference on Dynamics of Differential Equations, Gerogia Tech.,. March 16th, 2013
- AIMS’ 9th International Conference on Dyn. Systems, Diff. Equations and Applications. Orlando, EUA. July 1st, 2012

- Conference on the Applications of Dynamical Systems, SIAM Snowbird, USA. May 25th, 2011
 - Conference on Analysis and Math. Physics, Universidad Autónoma del Estado de Hidalgo Pachuca, Mexico. January 12th, 2011
 - International Conference of Industrial and Applied Mathematics (ICIAM) Vancouver, Canada. July 20th, 2011
 - AIMS’ 7th International Conference on Dyn. Systems, Diff. Equations and Applications. Arlington, USA. May 20 2008
 - AIMS’ 6th International Conference on Dyn. Systems, Diff. Equations and Applications. Poitiers, France. June 18th 2006
- *Contributed Talks, Workshops, and Seminars*
 - “Llavefest: A broad perspective on finite and infinite dimensional Dynamical Systems (FIDDS-17)”, Spain 8th, 2017
 - Seminari de Sistemes Dinàmics UB-UPC, UPC, Barcelona, Spain, June 14th, 2017
 - Junior Colloquium, Universit degli Studi di Roma Tor Vergata, Dipartimento di Matematica, Italy, January 11th, 2017
 - “Dynamics Days Latin America and the Caribbean”, Puebla, Mexico, October 26th, 2016
 - Workshop on “Coherent Structures in PDEs and Their Applications”, Oaxaca, Mexico, June 23rd , 2016
 - Workshop on “Hamiltonian Systems and Celestial Mechanics (HAMSYS2015)”, Oaxaca, Mexico, September 10th , 2015
 - “CRM-McGill Applied Mathematics Seminar”, Montreal, Canada, February, 2015
 - Workshop on “Hamiltonian Systems and Celestial Mechanics (HAMSYS 2014)”, CRM, Barcelona, Spain, June 2014
 - “Colloquium of the Institute for Mathematics-UNAM”, Cuernavaca, Mexico, May, 2014
 - “Seminari de Sistemes Dinàmics UB-UPC”, Barcelona, Spain, July, 2014
 - Workshop on “Planetary Motions, Satellite Dynamics, and Spaceship Orbits”, CRM, Montreal, Canada, August 22nd, 2013
 - Workshop on “Advanced Computational and Experimental Techniques in Nonlinear Dynamics”, Cusco, Peru, May 15th, 2013
 - CDSNS Colloquium, School of Mathematics, Georgia Tech. January 14th, 2013
 - Postdoc Seminar, IMA, University of Minnesota. October 9th, 2012

- Dynamical Systems Seminar, University of Toronto
Toronto, Canada. September 28th, 2011
- PDE/Analysis Seminar, McMaster University
Hamilton, Canada. September 30th, 2011
- Workshop on KAM Theory and Numerical Integration
Banff, Canada. June 10th, 2011
- Mathematics Seminar, Instituto Tecnológico Autónomo de México
Mexico City, Mexico. January 14th, 2011
- Workshop Bifurcation Analysis and Applications, Concordia University
Montreal, Canada. July 7th, 2010
- State-Dependent Delay Equations International Workshop, Max-Planck-Institut
für Physik komplexer Systeme, Dresden, Germany. October 13 2009.
- Centre de Recerca Matemàtica. Barcelona, Spain. October 8 2008.
- AIMS’ 7th International Conference on Dyn. Systems, Diff. Equations and
Applications. Arlington, USA. May 19 2008
- *IIMAS-UNAM, Nonlinear Waves in Continuous and Discrete Systems*. Mexico
City, Mexico. January 29 2008
- UPC, Dynamical Systems Seminar. Barcelona, Spain. February 15 2007
- AIMS’ 6th International Conference on Dyn. Systems, Diff. Equations and
Applications. Poitiers, France. June 18 2006

References

<p>Diego del Castillo-Negrete email: delcastillod@ornl.gov Senior Research Scientist Oak Ridge National Laboratory 1 Bethel Valley Rd, Oak Ridge, TN 37830, USA</p>	<p>Alessandra Celletti email: celletti@mat.uniroma2.it Dipartimento di Matematica Università di Roma “Tor Vergata” Via della Ricerca Scientifica 00133, Roma, Italy</p>
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