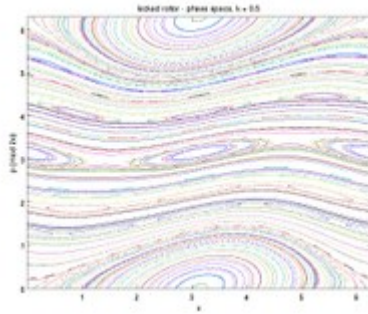


Laboratori de Geometria i Sistemes dinàmics



Membres del laboratori

Investigadors:

Amadeu Delshams (Professor Catedràtic)
 Marcel Guàrdia (Investigador Ramón i Cajal)
 Eva Miranda (Professor Agregat)

Estudiants de doctorat:

Roisin Braddell (Contractada PSR)
 Cédric Oms (Contractat AFR-Luxemburg)
 Arnau Planas (Contractat PSR)
 Rodrigo Schaefer (Becari CNPQ)

Membres externs del Laboratori:

David Martínez-Torres (PUC Rio de Janeiro), Professor

Asistente

Francisco Presas (ICMAT, Madrid), Científico Titular

Estudiants de TFG i TFM:

Robert Cardona

Responsable del Laboratori: **Eva Miranda**

Objectius generals del laboratori:

Pretenem reforçar la col·laboració iniciada entre els grups de recerca de [Sistemes dinàmics SD](#) i de [Geometria GEOMVAP](#). Ambdós grups presenten una dilatada trajectòria. Els grups tenen finançament MTM, SGR i recentment hem obtingut un projecte EXPLORA CIÈNCIA.

Objectius científics:

- Aprofundir en l'estudi geomètric del problema de 3-cossos i les seves versions restringides usant tècniques pròpies dels sistemes dinàmics i de la geometria simplèctica i de Poisson (varietats b-simplèctiques).
- Estudiar l'existència d'òrbites periòdiques usant les tècniques de topologia simplèctica.
- Millorar els resultats de teoria KAM per sistemes associats a problemes motivats per mecànica (com l'estudi de la varietat de col·lisions en el problema de 3-cossos). La teoria KAM està associada a l'estudi de perturbacions.
- Estudiar problemes d'integrabilitat en varietats de Poisson i varietats simplèctiques singulars motivats per problemes de mecànica celeste.

Congressos recents organitzats pel grup:

[Finite Dimensional Integrable Systems In Geometry And Mathematical Physics \(FDIS 2017\)](#)

[Follow Up Of The Research Program Geometry And Dynamics Of Integrable Systems](#)

[Workshop on Interactions Between Dynamical Systems and Partial Differential Equations \(JISD2016\)](#)

[Gesta December 2016](#)

[Junior Gesta](#)

[GESTA Itinerant I 2016](#)

Activitat docent

El professorat del laboratori té activitat docent en les següents titulacions:

Arquitectura Tècnica en Edificació
Grau en Matemàtiques
Master's degree in Advanced Mathematics and Mathematical Engineering
Graduate courses at the Barcelona Graduate School of Mathematics

Camps de recerca:

- *Symplectic Geometry*
- *KAM and perturbation theory*
- *Poisson Geometry*

- *Rigidity of Geometrical Structures*
- *Hamiltonian group actions*
- *Convexity, Delzant theorem and polytopes*
- *Desingularization of Poisson manifolds*
- *Effective stability of Hamiltonian and reversible Systems*
- *whiskered tori*
- *hyperbolic invariant objects*
- *splitting of separatrices*
- *Arnold diffusion.*

Premis i distincions

- Eva Miranda ha estat reconeguda amb una Chaire d'Excellence de la Fondation Sciences Mathématiques de Paris al Gener de 2017.
- Marcel Guàrdia va guanyar el premi Primer Barcelona Dynamical Systems Prize (2015) (ex-aequo), atorgat per la Societat Catalana de Matemàtiques a l'article "Oscillatory motions for the restricted planar circular three body problem".
- Roger Casals (alumne de Francisco Presas) guanya el premi Rubio de Francia (2016).
- Roger Casals (alumne de Francisco Presas) guanya el premi Vicenç Caselles (2016).

Altres reconeixements:

- Cédric Oms va guanyar una beca AFR PhD grant from the Fondation Nationale de la Recherche Luxembourg.

- Rodrigo Shaeffer va guanyar una beca doctoral CNPQ.
- Roisin Braddell va guanyar una Algant Excellence Full Scholarship, ALExS 2015.
- Roisin Braddell va ser acceptada a l'Irish Center for Talented Youth Summer Program, Dublin City University

Tesis doctorals dirigides durant el curs acadèmic:

Durant el curs 2015-2016, hem dirigit les següents tesis doctorals

- *Integrable systems on b-Poisson structures*, Autor: Anna Kiesenhofer (beca FI-AGAUR), Director: Eva Miranda, UPC, Data Desembre de 2016, Qualificació: Excellent Cum Laude per unanimitat.
- *Diffusion through non-transverse heteroclinic chains: A long-time instability for the NLS*, Autor: Adrià Simon, Director: Amadeu Delshams, UPC, (2015) Qualificació: Excellent Cum Laude per unanimitat.
- *Contact Fibrations over the 2-disk*, Autor: Roger Casals, Director: Francisco Presas, ICMAT Data: 201 Qualificació: Excellent Cum Laude per unanimitat.

TFM's i TFG'S dirigits durant el curs acadèmic:

- *Symplectic manifolds with singularities*. Tesi de Màster FME-UPC, Autor: Arnau Planas, Director :Eva Miranda, Qualificació: 10-MH

- *Asymptotic Size of Herman Rings Using Quasiconformal Surgery*, Treball de Final de Grau FME-UPC, Autor: Francesc Granell, Director: Marcel Guardia i Pau Martin. Qualificació: 10-MH

TFM's realitzats per membres del grup a l'estranger:

- *Applications of Characteristic Classes and Milnor's Exotic Spheres*. Tesi de Màster UB, Autor: Roisin Braddell, Director: Prof. Vincent Koziarz, University of Bordeaux.
- *Minmax principle: Closed geodesics and the Willmore conjecture*, Tesi de Màster ULB, Autor: Cédric Oms, Director: Joel Fine, Université Libre de Bruxelles, 2016

Producció Científica:

- Anna Kiesenhofer and Eva Miranda, Cotangent models for integrable systems, Communications in Mathematical Physics, published online DOI:10.1007/s00220-016-2720-x, 2016.
- Anna Kiesenhofer and Eva Miranda, Noncommutative integrable systems on b-symplectic manifolds, to appear at Journal of Regular and Chaotic Dynamics, 2016.
- Amadeu Delshams, Eva Miranda and Anna Kiesenhofer, Examples of integrable and non-integrable systems on singular symplectic manifolds,

published online at Journal of Geometry and Physics, 2016.

- Victor Guillemin, Eva Miranda, Ana Pires and Geoffrey Scott, Convexity for Hamiltonian torus actions on b-symplectic manifolds, Mathematical Research letters, to appear.
- David Martínez Torres, Eva Miranda Weakly Hamiltonian actions, Journal of Geometry and Physics, published online, 2016.
- Chiara Esposito and Eva Miranda, Rigidity of infinitesimal momentum maps, Israel Journal of Mathematics, to appear, 2016.
- Pedro Frejlich, David Martínez and Eva Miranda, A note on Symplectic topology on b-symplectic manifolds, accepted at The Journal of Symplectic Geometry 2016.
- A. Kienhofer, E. Miranda and G. Scott, Action-angle variables and aKAM theorem for b-Poisson manifolds, J. Math. Pures Appl. (9) 105 (2016), no. 1, 66-85.
- Victor Guillemin, Eva Miranda, Ana Pires and Geoffrey Scott, Toric actions on b-manifolds, Int Math Res Notices Int Math Res Notices (2015)2015 (14): 5818--5848.
- Eva Miranda and Francisco Presas, Geometric Quantization of real polarizations via sheaves, J. Symplectic Geom. 13 (2015), no. 2, 421-462.
- Delshams, Amadeu; Schaefer, Rodrigo G. Arnold Diffusion for a Complete Family of Perturbations. Regul. Chaotic Dyn. 22 (2017), no. 1, 178-108.
- Delshams, Amadeu; Gonchenko, Marina; Gonchenko, Sergey. On bifurcations of homoclinic tangencies in area-preserving maps on non-orientable manifolds. Springer Proc. Math. Stat. 180 (2016), 107-125.
- Delshams, Amadeu; Gidea, Marian; Roldán, Pablo. Arnold's mechanism of diffusion in the spatial circular restricted three-body problem: a semi-analytical argument. Phys. D 334 (2016), 29-48.
- Delshams, Amadeu; Gonchenko, Marina; Gutiérrez, Pere. Exponentially small splitting of separatrices and transversality associated to whiskered tori with quadratic frequency ratio. SIAM J. Appl. Dyn. Syst. 15 (2016), no. 2, 981-1024.
- Delshams, Amadeu; Llave, Rafael de la; Seara, Tere M. Instability of high dimensional Hamiltonian systems: multiple resonances do not impede diffusion. Adv. Math. 294 (2016), 689-755.
- Delshams, Amadeu; Gonchenko, Marina; Gonchenko, Sergey. On dynamics and bifurcations of area-preserving maps with homoclinic tangencies. Nonlinearity 28 (2015), no. 9, 3027-3071.
- Delshams, Amadeu; Gonchenko, Marina; Gutiérrez, Pere. A methodology for obtaining asymptotic estimates for the exponentially small splitting of separatrices to whiskered tori with quadratic frequencies. Trends in Mathematics, Volume 4 (2015), pages 31-37.
- Stefanella Boatto, David G. Dritschel, Rodrigo G. Schaefer, "N-body dynamics on closed surfaces: the axioms of mechanics", Proceedings of the royal society A, Issue 2192, Volume 472, 2016
- M. Guardia, V. Kaloshin. "Growth of Sobolev norms in the cubic defocusing nonlinear Schrödinger

- equation”, *Journal of the European Mathematical Society*, 17 (1): 71–149 (2015)
- M. Guardia, P. Martín, T. Seara. “Oscillatory motions for the restricted planar circular three body problem”, *Inventiones Mathematicae*, 2: 417–492 (2016).
 - J. Féjóz, M. Guardia, V. Kaloshin, P. Roldán. “Kirkwood gaps and diffusion along mean motion resonances in the restricted planar three-body problem”, *Journal of the European Mathematical Society*, 18 (10): 2315–2403 (2016).
 - E. Haus, M. Guardia and M. Procesi. “Growth of Sobolev norms for the defocusing analytic NLS on T^2 ”, *Advances in Mathematics*, 301: 615–692 (2016).
 - M. Guardia, J. Féjóz. “Secular instability in the spatial three-body problem”, *Archive for Rational Mechanics and Analysis*, 221(1): 335–362 (2016).
 - M. Guardia, V. Kaloshin, J. Zhang. “A second order expansion of the separatrix map for trigonometric perturbations of a priori unstable systems”, *Communication in Mathematical Physics*, 348(1), 321–361 (2016).
 - M. Guardia, P. Martín, T. M. Seara. “Oscillatory orbits in the restricted elliptic planar three body problem”, *Discrete and Continuous Dynamical Systems A*, 37 (1): 229–256 (2017).
 - Ulrich Aschauer, Roisin Braddell, Sonia A. Brechbühl, Peter M. Derlet and Nicola A. Spaldin, “Strain-induced structural instability in FeRh”; *Physical Review B*, Vol. 94 Iss. 1, 14109, 2016
 - D. Martínez-Torres, A. del Pino, F. Presas, Transverse geometry of foliations calibrated by non-degenerate closed 2-forms, to appear in *Nagoya Mathematical Journal*.
 - Casals, R., Presas, F., Sandon, S., On the non-existence of small positive loops of contactomorphisms on overtwisted contact manifolds. *J. Symplectic Geom.* 14 (2016), no.4, 1013--1031.
 - D. Peralta-Salas, A. del Pino, F. Presas, Foliated vector fields without periodic orbits, *Isr. J. Math.* 214, No. 1, 443-462 (2016).
 - Presas, F., Non-integrable distributions and the h-principle. *Eur. Math. Soc. Newsl.* 99, 18--26 (2016).
 - Casals, R., Presas, F., On the strong orderability of overtwisted 3-folds, *Comment. Math. Helv.* 91, No. 2, 305-316 (2016).
 - Casals, R., Ginzburg, V., Presas, F., Higher Maslov indices, *Journal of Geometry and Physics* (2016). doi:10.1016/j.geomphys.2016.03.021
 - Casals, R., del Pino, A., Presas, F., h-Principle for Contact Foliations, *Int Math Res Notices* (2015) Vol. 2015 10176-10207.
 - Casals, R., Pancholi, D., Presas, F., Almost contact 5-manifolds are contact. *Annals of Mathematics*, vol. 182, n. 2 (2015) 429-490.
 - Casals, R., Pancholi, D., Presas, F., Contact blow-up, *Expo. Math.* 33 (2015), no. 1, 78--100.
 - D. Martínez-Torres, Semisimple coadjoint orbits and cotangent bundles. *Bull. Lond. Math. Soc.* DOI: 10.1112/blms/bdw058

- D. Martínez-Torres, The diffeomorphism type of canonical integrations of Poisson tensors on surfaces. *Canad. Math. Bull.* 58 (2015), no. 3, 575–579
- D. Martínez-Torres, M. Crainic and R. L. Fernandes, Poisson manifolds of compact types (PMCT 1). *Journal für die reine und angewandte Mathematik(Crelle's Journal)*, 2017.

Projectes Finançats:

- Dinámica Asociada a Conexiones entre Objetos Invariantes. Aplicaciones a Neurociencia y Astrodinámica (DACOBIANA), MINECO/FEDER MTM2015-65715-P, Univ. Politècnica de Catalunya, 2016-2018, PI: T. M. Seara, 16 researchers, 202 312 EUR.
- Dynamics and bifurcations of dissipative and conservative systems, Russian Scientific Foundation 14-41-00044, Univ. Nizhny Novgorod and Imperial College, Univ. Politècnica de Catalunya, up to 9 European or American Universities, 2014-2016. PI: Dimitry Turaev (Imperial College), 26 researchers, 27 000 000 RUB = 544 350 EUR.
- Grup de recerca consolidat-Sistemes Dinàmics de la UPC, CIRIT 2014SGR504, Univ. Politècnica de Catalunya, 2014-2016, PI: T. M. Seara, 33 researchers, 63 000 EUR.
- Dinámica Asociada a Conexiones entre Objetos Invariantes. Aplicaciones a Astrodinámica, Neurociencia y otros campos (DACOBIANO), MINECO-FEDER MTM2012-31714, Univ. Politècnica

de Catalunya, 2013-2015, PI: A. Delshams, 32 researchers, 282 672 EUR.

- Brazilian European Partnership in Dynamical Systems (BREUDS), European Call. Marie Curie Action FP7-PEOPLE-2012-IRSES, Imperial College London, Universitat Politècnica de Catalunya, IMPA, up to 32 European or Brazilian Universities or Research Centers, 2013-2015. PI: Jeroem Lamb (Imperial College), 707 000 EUR.
- MTM2015-69135-P, *Geometría y Topología de variedades, álgebra y aplicaciones (IP: Marta Casanellas and Eva Miranda)*, 14 researchers, Total amount: 182.226,00 €.
- *Geometria de varietats i aplicacions*, Competitive project Funding entity AGAUR. Agència de Gestió d'Ajuts Universitaris i de Recerca 2014 SGR 634 Amount 30.000,00 €
- *EXPLORA ciencia MTM2015-72876-EXP based at ICMAT-CSIC (Members: Alberto Ibort, Eva Miranda and Francisco Presas(IP))*. Total amount: 15000 euros.