

# Juan Margalef Bentabol

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★ 16/03/1988 (Madrid-Spain)  
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Last update: March 5, 2018

## Current position

2014– **La Caixa Fellowship for Ph.D. students 2014-2018 at UC3M-CSIC**  
*Supervisors: J.F. Barbero (IEM-CSIC) and E.J.S. Villaseñor (UC3M)*

## Education and training

Second national prize of Spain in Mathematics 2010/2011.

Accomplishment in 7 years of a 5-B.A. in Mathematics, a 5-B.A. in Physics and a 1-M.A. in Mathematical research.

2017 **Research stay**

*Institute for quantum gravity (FAU Erlangen) - 3 months with Dr. Hanno Sahlmann.*

2016 **Research stay**

*TU Wien - 3 months with Dr. Martin Bauer.*

2011–2012 **M.A. in Mathematical research**

*UCM - Specialization in geometry and topology. Overall mark 9.61/10.*

2006–2011 **Degree in Mathematics**

*UCM - Specialization in fundamental Mathematics. Overall mark 9.38/10.*

2008–2013 **Degree in Physics**

*UCM - Specialization in fundamental Physics. Overall mark 8.82/10.*

2012–2013 **Erasmus program**

*ULB. Overall Mark: A rate (top 5% of 2012–2013) with 16.94/20.*

2009–2010 **Sicue program (with a Séneca grant)**

*UB. Overall Mark 9.74/10.*

2002–2006 **A-level (High School). Double route: Natural sciences and technology**

*IES Mirasierra. Overall mark 9.8/10. Best student of the 2005–2006 promotion.*

## Published papers

- [1] **On the distribution of the eigenvalues of the area operator in loop quantum gravity**  
*J. Fernando Barbero, Juan Margalef-Bentabol, Eduardo J.S. Villaseñor,*  
*Classical and Quantum Gravity* 35 (2018) 065008 [[arXiv:1712.06918](https://arxiv.org/abs/1712.06918)]

- [2] **Boundary Hilbert spaces and trace operators**  
*J. Fernando G. Barbero, Benito A. Juárez-Aubry, Juan Margalef-Bentabol, Eduardo J.S. Villaseñor,*  
*Classical and Quantum Gravity* 34 (2017) 095005 [[arXiv:1701.00735](#)]
- [3] **Functional evolution of scalar fields in bounded one-dimensional regions**  
*J. Fernando G. Barbero, Juan Margalef-Bentabol, Eduardo J.S. Villaseñor,*  
*Classical and Quantum Gravity* 34 (2017) 065004 [[arXiv:1611.09603](#)]
- [4] **Hamiltonian dynamics of the parametrized electromagnetic field**  
*J. Fernando Barbero, Juan Margalef-Bentabol, Eduardo J.S. Villaseñor,*  
*Classical and Quantum Gravity* 33 (2016) 125030 [[arXiv:1511.00826](#)]
- [5] **Hamiltonian description of the parametrized scalar field in bounded spatial regions**  
*J. Fernando Barbero, Juan Margalef-Bentabol, Eduardo J.S. Villaseñor,*  
*Classical and Quantum Gravity* 33 (2016) 105002 [[arXiv:1507.05438](#)]
- [6] **Realization problems for limit cycles of planar polynomial vector fields**  
*Juan Margalef-Bentabol, Daniel Peralta-Salas,*  
*Journal of Differential Equations* 260 (2015) 4 [[arXiv:1507.00698](#)]
- [7] **Quantization of scalar fields coupled to point-masses**  
*J. Fernando Barbero, Benito A. Juárez-Aubry, Juan Margalef-Bentabol, Eduardo J.S. Villaseñor,*  
*Classical and Quantum Gravity* 32 (2015) 245009 [[arXiv:1501.05114](#)]
- [8] **Topology of the Misner Space and its g-boundary**  
*Juan Margalef-Bentabol, Eduardo J.S. Villaseñor,*  
*General Relativity and Gravitation* 46 (2014) 1755 [[arXiv:1406.4552](#)]
- [9] **Evolution of the Cosmological Horizons in a Universe with Countably Infinitely Many State Equations**  
*Berta Margalef-Bentabol, Juan Margalef-Bentabol, Jordi Cepa,*  
*Journal of Cosmology and Astroparticle Physics* 02 (2013) 015 [[arXiv:1302.2186](#)]
- [10] **Evolution of the Cosmological Horizons in a Concordance Universe**  
*Berta Margalef-Bentabol, Juan Margalef-Bentabol, Jordi Cepa,*  
*Journal of Cosmology and Astroparticle Physics* 12 (2012) 035 [[arXiv:1302.1609](#)]
- [11] **Contractions of low-dimensional nilpotent Jordan algebras**  
*J. M. Ancochea Bermudez, J. Fresan, Juan Margalef-Bentabol,*  
*Communications in Algebra* 39 (2011) 1139-1151 [[arXiv:0805.3758](#)]
- [12] **Sur la réductibilité des variétés des lois d'algèbres de Leibniz complexes**  
*J.M. Ancochea-Bermúdez, J. Margalef-Bentabol,*  
*Journal of Lie Theory*, 17 (2007) 617–624 [[arXiv: 1508.00253](#)]

## Honors and awards

Total amount awarded in prizes, awards and grants: **184050€**.

### University Level

2014 Second national prize of Spain of the 2010/2011 class. Awarded by the Spanish ministry of education (2650€).

2016-2018 Full fellowship to live at the *Residencia de estudiantes* (worth 33600€).

- 2014 First position in the area of science at the prestigious Ph.D. fellowship of “La Caixa” foundation (duration of 4 years, 113500€).
- 2012 Best scientific report of the CSIC (Spanish Research Council) in 2012 for the work *Horizons and null submanifolds in General Relativity* under the supervision of Dr. Fernando Barbero (3000€).
- 2011 First prize at the *X Certamen universitario Arquímedes* (most important research contest for undergraduate students organized by the Spanish ministry of education) with the work *Inverse Problems of limit cycles in planar polynomial systems* (9000€).
- 2011 Awarded at the *X Certamen Universitario Arquímedes* with a stay of two weeks in a center of CSIC.
- 2010 Awarded with a *JAЕ Intro* grant at the CSIC for the introduction to the scientific research under the supervision of Dr. Daniel Peralta Salas, of the ICMAT-CSIC (1500€).
- 2010 Grant of excellence awarded by the government of Madrid (5000€).
- 2007 First prize at the *XX Certamen Jóvenes Investigadores* (most important research contest for bachelor students organized by the Spanish Ministry of Education) with the work *Reducibility of the complex Leibniz algebras* (4500€).
- 2006 Grant of excellence awarded by the government of Madrid (5000€).

#### Pre-university Level

- 2006 Honorary Mention at the 38th International Chemistry Olympiad (Gyeongsan - South Korea).
- 2006 Bronze medal at the 11th Ibero-american Chemistry Olympiad (Aveiro - Portugal).
- 2006 Gold medal at the 19th National Chemistry Olympiad (Vigo - Spain, 750€).
- 2006 Silver Medal at the 17th National Physics Olympiad (Teruel - Spain).
- 2006 Gold Medal at the Local Chemistry Olympiad (Madrid - Spain, 330€).
- 2006 Gold Medal at the Local Physics Olympiad (Madrid - Spain, 220€).

## Contributions to conferences

- 2018 **Understanding the geometry of the Misner spacetime through topology**  
12th International young researchers workshop on GMC, (UNIPD).
- 2017 **Topology and general relativity, it takes two to tango**  
VI Postgraduate meeting on theoretical physics, (UV).
- 2017 **Why parametrize field theories?**  
IX Jornadas CPAN, (CPAN).
- 2017 **On the realization of limit cycles in planar polynomial systems**  
XXV CEDYA, (UPCT).
- 2017 **Geometry, constraints and boundaries. It takes three to tango.**  
Quantum gravity seminar, (FAU Erlangen-Nürnberg).
- 2017 **About non standard boundary conditions**  
Quantum gravity seminar, (FAU Erlangen-Nürnberg).
- 2017 **When continuous meets discrete: quantization of field systems with point-masses**  
V Iberoamerican meeting on GMC, (ULL).
- 2016 **Playing with the Misner space and the topology**  
De Madrid al Cosmos, (IEM-CSIC).

- 2016 **On the realization of limit cycles in planar polynomial systems**  
Nonlinear integrable systems, (UBU).
- 2016 **Parametrized theories, making EM even "gaugier"**  
21st Int. conference on general relativity and gravitation, (University of Columbia).
- 2016 **Parametrized theories, making EM even "gaugier"**  
Vienna relativity seminar, (UWien).
- 2016 **Misner space as a (toy) counterexample to almost anything**  
GAP seminar, (UWien).
- 2016 **Parametrized theories, making EM even "gaugier"**  
Geometry TUWien seminar, (TU Wien).
- 2016 **The space of embeddings within the Hamiltonian formulation of the electromagnetism**  
XVIII Winter meeting on GMC, (UZ).
- 2016 **Hamiltonian dynamics of the parametrized electromagnetic field**  
10th International young researcher workshop on GMC, (HIP-Paris).
- 2015 **Embeddings as variables in the Hamiltonian formulation of a field theory**  
ULL mathematical seminar, (ULL).
- 2015 **Parametrized field theories in bounded regions**  
Spanish relativity meeting, (UIB).
- 2015 **Hamiltonian dynamics of the parametrized scalar field with boundaries**  
XXIV International fall workshop in geometry and physics, (CUD-UZ).
- 2014 **Quantization of field theories coupled to point-masses**  
IFF-CSIC seminar, (CSIC).
- 2014 **From classical mechanics to quantum mechanics**  
PhD student seminar UCM, (UCM).
- 2014 **Understanding some pathologies in general relativity through topology**  
III Spanish young topologists meeting, (USC).
- 2014 **Quantization of field theories coupled to point-masses**  
Mathematical-Physics seminar, (University of Nottingham).
- 2014 **Topology of the Misner space and its g-boundary**  
Spanish relativity meeting, (UV).
- 2013 **Introduction to catastrophe theory**  
II Spanish young topologists meeting, (UB).
- 2013 **Are there really 17 ways of making a tessellation of the plane?**  
Seminar of algebra, (US).
- 2013 **Sur la clasifcation topologique des pavages**  
Mathématiques à table, (ULB).
- 2012 **Inverse problems of limit cycles in planar polynomial systems**  
I Spanish meeting of young topologists, (US).
- 2012 **Rational homotopy theory and minimal models**  
Workshop of young researchers in mathematics, (UCM).

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## Professional activities

Referee/Reviewer: AMS, General relativity and gravitation.

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## Outreach activities

- 2018 **¿Qué pinta la topología en la Alhambra?**  
Seminario Junior IGM, (UC3M).
- 2017 **Contando con clips llegamos a... ¡los grafos!**  
XVI Semana de la ciencia, (UC3M).
- 2017 **Contando con clips llegamos a... ¡los grafos!**  
XVI Semana de la ciencia, (IEM-CSIC).
- 2017 **Can boundaries and Hamiltonians get along?**  
Classical and quantum gravity blog, (CQG+).
- 2017 **Clips y números naturales**  
La Aventura del Saber, (RTVE).
- 2016 **¿Sabía Escher Topología?**  
Un fisquito de matemáticas, (ULL).
- 2016 **La Alhambra, Escher y 17, el número mágico**  
XVI Semana de la ciencia, (UC3M).
- 2016 **La Alhambra, Escher y 17, el número mágico**  
XVI Semana de la ciencia, (IEM-CSIC).
- 2016 **Poquito a poco me voy cuantizando**  
Seminario Junior IGM, (UC3M).
- 2016 **¡Se oyen, se sienten, las ondas gravitatorias están presentes!**  
Seminario Junior IGM, (UC3M).
- 2015 **¡Menuda catástrofe!**  
Seminario Junior IGM, (UC3M).
- 2015 **La Alhambra, Escher y 17 ¡el número mágico!**  
XV Semana de la ciencia, (IEM-CSIC).
- 2015 **Classical vs Quantum: Two views of the world**  
International Loop Quantum Gravity Seminar, (LSU).

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## Conference organization

- 2018 Trivulgando: investigación, sociedad y divulgación (Residencia de Estudiantes).
- 2017 Challenges in nonlinear systems: a meeting to celebrate the 60th birthday of prof. L.L. Bonilla (UC3M).
- 2016 Organizer of the 25th international fall workshop on geometry and physics (IEM-CSIC).
- 2015-2017 Organizer of the junior seminar of the Gregorio Millán Barbany (UC3M).
- 2015 Organizer of the 4th Spanish Young Topologist Meeting (UCM).
- 2015 Organizer of the 1st encounter of *The Invisible Faculty* (Madrid).
- 2013 Volunteer of the 10th *AIMS conference on dynamical systems differential equations and applications* (ICMAT).
- 2008 Volunteer of the 49th International Mathematical Olympiad (Madrid).
- 2008 Collaborator in the organization of the 21st National Chemistry Olympiad (Castellón).
- 2007 Coorganizer of the 20th National Chemistry Olympiad (Córdoba).

## Courses attended

- 2014 Summer doctoral school held at the IMPA in Río de Janeiro (two months long).
- 2014 8th ICMAT International Summer School on Geometry, Mechanics and Control hold in Madrid (two weeks long).
- 2010 Summer school JAE Intro of introduction to research in Madrid at the ICMAT-CSIC (two months long).

## Teaching experience

- Assistant professor of Linear Algebra at the computer science grade of UC3M (2017).
- Supervisor of the final degree project of Carlos Blasco Navarro entitled *Can we hear the shape of a drum?*
- Assistant professor of calculus problems at the computer science grade of UC3M (2016).
- Granted with a complete fellowship to attend the course “The use of ICT on 21st century Higher Education” at UIMP (2016).
- Assistant professor of linear algebra problems at the computer science grade of UC3M (2015).  
Overall mark given by the students on the quality surveys: 4.81/5.
- Course for developing teaching skills at UC3M (2015 and 2016).
- Teacher of the students participating in the local, national and international chemistry olympiads of 2007 and 2008.

## Languages

Spanish	Native	
Catalonian	Native	
English	C2	<i>Nivel C1.2 by the Escola d'Idiomes Moderns of the UB (2013).</i>
Portuguese	C2	<i>2 stays of four months in Brazil.</i>
French	C1	<i>Certificate of the section de langues et littératures of the ULB. Stay for a year at Brussels (Belgium) with the Erasmus program.</i>
Italian	B1	
German	A2	<i>1 stay of three months in Vienna (Austria). 1 stay of three months in Erlangen (Germany).</i>

## Programming languages

Imperative	Pascal	<i>High</i>
	C++	<i>Intermediate</i>
	Python	<i>Intermediate-Low</i>
Functional	Haskell	<i>Intermediate</i>
Logical	Prolog	<i>Intermediate-Low</i>

Symbolic calculus	Mathematica	<i>High</i>
	Maple	<i>Intermediate-Low</i>
Numerical Calculus	Matlab/Octave	<i>Very high</i>
Edition	$\LaTeX 2\epsilon$	<i>High</i>
	$\TeX$	<i>Intermediate</i>
Web	HTML/CSS/JS/PHP	<i>Intermediate-high</i>

Webs I have hacked from templates:

- <http://juanmargalef.com>
- <http://trivulgando.es>
- <http://scala.uc3m.es/ftsm>
- <http://scala.uc3m.es/seminariojunior>
- <http://lafacultadinvisible.com>