

Fecha del CVA	04/02/2021
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Parte A. DATOS PERSONALES

Nombre y Apellidos	Juan Margalef Bentabol		
DNI/NIE/Pasaporte		Edad	
Núm. identificación del investigador	Researcher ID	A-3182-2015	
	Scopus Author ID	21739619300	
	* Código ORCID	0000-0003-0118-6284	

* Obligatorio

A.1. Situación profesional actual

Organismo	Penn State University		
Dpto. / Centro	Physics / Institute for gravitation and the cosmos		
Dirección			
Teléfono		Correo electrónico	
Categoría profesional	Postdoctoral	Fecha inicio	2019
Palabras clave			

A.2. Formación académica (título, institución, fecha)

Licenciatura/Grado/Doctorado	Universidad	Año

A.3. Indicadores generales de calidad de la producción científica

I have achieved significant results in the area of geometrization of field theories, algebra, topology, dynamical systems, and mathematical physics. This has led to 18 published papers in first-rate journals (14 of them in Q1), and written 4 preprints.

98 cites with an h-index of 5.

I have been distinguished with some of the most relevant awards for young researchers:

1. Second National Fin de Carrera Award for the graduating class of 2010/2011 granted only to the three best students of each degree in Spain by the Ministry of Education.
2. 10th Arquímedes University Contest with a work directed by Daniel Peralta.
3. Best scientific report of the CSIC of 2012 for the work directed by Fernando Barbero.
4. First prize in the 20th Young Researcher Competition with a project directed by José María Ancochea.
5. JAE-intro research scholarship under the supervision of Daniel Peralta.
6. Several excellence scholarships of the Comunidad de Madrid during my undergraduate studies.
7. Several medals in both physics and chemistry in national and international Olympiads.
8. Ranked first in the prestigious scholarships of Fundación La Caixa for pre-doctoral studies.
9. A MINECO grant to live and develop my research in the historical Residencia de Estudiantes.
10. Extraordinary award for the PhD developed at UC3M.

Parte B. RESUMEN LIBRE DEL CURRÍCULUM

I completed my studies in mathematics (5-year degree 9.38/10 and 1-year master 9.61/10) and physics (5-year degree 8.82/10) at the UCM, being the second best student of Spain in Mathematics 2010/2011. I studied the fourth year of Mathematics at the UB (9.74/10) as a Seneca/Sicue student and the fifth year of physics at the Université Libre de Bruxelles (16.94/20 with A-rate) as an Erasmus student. After my undergraduate studies, I spent three months at the Instituto de Matematica Pure e Aplicada (IMPA) of Rio de Janeiro attending the summer school for Ph.D. students.

I began my Ph.D. at UC3M in September 2014 and I did two research stays: three months at the TUWien and three months at the FAU Erlangen-Nürnberg. In July 2018, I submitted my thesis and graduated with the highest honor (cum laude), international mention, and extraordinary award. After that, I spent three months at ICMAT working with Daniel Peralta as an ERC postdoctoral fellow and, from January 2019 to August 2019, I was working with Eva Miranda at UPC as an ICREA postdoctoral fellow. Currently, I am working with Abhay Ashtekar at the Institute for Gravitation and the Cosmos at Penn State University.

During my research career, I have published 18 papers in first-rate journals, delivered more than 40 talks in international conferences, organized several international meetings, supervised two B.A. thesis and one Ph.D. thesis, being awarded the most prestigious prizes for young researchers in Spain, and being actively engaged in science communication as the winner of the Spanish-FameLab contest.

My main research focuses on understanding the geometry of field theories, both from the covariant perspective and the Hamiltonian one. In the former, I have developed the relative bicomplex framework that has solved several long lasting problem. As for the later, I study interplay among boundaries, parametrized theories, and the GNH algorithm. For that, I have explored systematically relevant theories, from a physical and mathematical point of view including General Relativity and some of its extensions. To do this, I study the Lagrangian and Hamiltonian formulation of actions defined over manifolds with boundaries, the degeneracy of the solutions to the equations of the theory, and their integrability. To pursue these studies, it is essential to apply tools from several branches like differential, affine, and Riemannian geometry (to deal with the base manifold), symplectic geometry (to study the cotangent bundle of certain manifolds), measure theory (as one of the methods to rigorously include boundaries), dynamical systems (to properly understand the solutions), convenient calculus (to deal with spaces of mappings such as the space of embeddings), or functional analysis (to take account for the regularity of the solutions and their integrability). My research then focused on understanding some field theories with boundaries (e.g. unimodular gravity, general relativity, or Hussain-Kuchar models) and study them with the aforementioned tools.

Parte C. MÉRITOS MÁS RELEVANTES (ordenados por tipología)

C.1. Publicaciones

AC: Autor de correspondencia; ($n^{\circ} x / n^{\circ} y$): posición firma solicitante / total autores

- 1 **Artículo científico**. (AC); Eduardo Sánchez Villaseñor. (1/2). 2021. Geometric formulation of the Covariant Phase Space methods with boundaries *Physical Review D*.
- 2 **Artículo científico**. (AC); Bogar Díaz; Juan Margalef Bentabol; Eduardo Sánchez Villaseñor. (1/4). 2021. Hamiltonian GNH analysis of the parametrized unimodular extension of the Holst action *Physical Review D*.
- 3 **Artículo científico**. (AC); Bogar Díaz; Juan Margalef Bentabol; Eduardo Sánchez Villaseñor. (1/4). 2021. Concise symplectic formulation for tetrad gravity *Physical Review D*.
- 4 **Artículo científico**. Juan Margalef Bentabol; Eduardo Sánchez Villaseñor; Fernando Barbero González. 2020. A two-sided Faulhaber-like formula involving Bernoulli polynomials *Comptes Rendus. Mathématique*. 1, pp.41-44.
- 5 **Artículo científico**. Jesús Fernando Barbero González; Juan Margalef-Bentabol; Eduardo Jesús Sánchez Villaseñor. 2019. Dirac's algorithm in the presence of boundaries: a practical guide to a geometric approach *Classical and Quantum Gravity*. 35-065008. ISSN 0264-9381.
- 6 **Artículo científico**. Fernando Barbero González; Juan Margalef Bentabol; Eduardo Sánchez Villaseñor. 2019. Generalizations of the Pontryagin and Husain-Kuchař actions to manifolds with boundary *Journal of High Energy Physics*.
- 7 **Artículo científico**. Jesús Fernando Barbero González; Juan Margalef-Bentabol; Eduardo Jesús Sánchez Villaseñor. 2018. On the distribution of the eigenvalues of the area operator in loop quantum gravity *Classical and Quantum Gravity*. 35-065008. ISSN 0264-9381.

- 8 **Artículo científico.** Jesús Fernando Barbero González; Benito Juárez Aubry; Juan Margalef Bentabol; Eduardo Jesús Sánchez Villaseñor. 2017. Boundary Hilbert spaces and trace operators *Classical and Quantum Gravity*. 34-095005. ISSN 0264-9381.
- 9 **Artículo científico.** Jesús Fernando Barbero González; Juan Margalef Bentabol; Eduardo Jesús Sánchez Villaseñor. 2017. Functional evolution of scalar fields in bounded one-dimensional regions *Classical and Quantum Gravity*. 34-065004. ISSN 0264-9381.
- 10 **Artículo científico.** Fernando Jesús Barbero González; Juan Margalef Bentabol; Eduardo Jesús Sánchez Villaseñor. 2016. Hamiltonian dynamics of the parametrized electromagnetic field *Classical and Quantum Gravity*. 33-125030. ISSN 0264-9381.
- 11 **Artículo científico.** Jesús Fernando Barbero González; Juan Margalef Bentabol; Eduardo Jesús Sánchez Villaseñor. 2016. Hamiltonian description of the parametrized scalar field in bounded spatial regions *Classical and Quantum Gravity*. 33-105002. ISSN 0264-9381.
- 12 **Artículo científico.** Daniel Peralta Salas; Juan Margalef Bentabol. 2016. Realization problems for limit cycles of planar polynomial vector fields *Journal of Differential Equations*. 260-4, pp.3844-3859. ISSN 0022-0396.
- 13 **Artículo científico.** Jesús Fernando Barbero González; Benito Juárez Aubry; Juan Margalef Bentabol; Eduardo Jesús Sánchez Villaseñor. 2015. Quantization of scalar fields coupled to point masses *Classical and Quantum Gravity*. 32-245009. ISSN 0264-9381.
- 14 **Artículo científico.** Eduardo Jesús Sánchez Villaseñor; Juan Margalef Bentabol. 2014. Topology of the Misner space and its g -boundary *General Relativity and Gravitation*. 46-1755. ISSN 0001-7701.
- 15 **Artículo científico.** Berta Margalef Bentabol; Juan Margalef Margalef; Jordi Cepa. 2013. Evolution of the cosmological horizons in a universe with countably infinitely many state equations *Journal of Cosmology and Astroparticle Physics*. 02-015. ISSN 1475-7516.
- 16 **Artículo científico.** Berta Margalef Bentabol; Juan Margalef Bentabol; Jordi Cepa. 2012. Evolution of the cosmological horizons in a concordance universe *Journal of Cosmology and Astroparticle Physics*. 12-035. ISSN 1475-7516.
- 17 **Artículo científico.** José María Ancochea Bermudez; Javier Fresán; Juan Margalef Bentabol. 2011. Contractions of Low-Dimensional Nilpotent Jordan Algebras *Communications in Algebra*. 39-3. ISSN 0092-7872.
- 18 **Artículo científico.** José María Ancochea Bermúdez; Juan Margalef Bentabol; Jonathan Sánchez Hernández. 2007. Sur la Réductibilité des Variétés des Lois d'Algèbres de Leibniz Complexes *Journal of Lie Theory*. ISSN 0949-5932.
- 19 **Libro o monografía científica.** Juan Margalef Bentabol. 2018. Towards general relativity through parametrized theories *Doctoral thesis*.

C.2. Proyectos

C.3. Contratos

C.4. Patentes