
Bogar Díaz Jiménez

Personal data

Email: bogardj@gmail.com

Web page: <http://scala.uc3m.es/diazb>

Orcid: [0000-0002-0549-5706](https://orcid.org/0000-0002-0549-5706)

Publons (P): [G-7210-2019](https://publons.com/author/pub/72102019)

Google citations (G): [Bogar Díaz](#)

Citations: G 116, P 79

h-index: G 7, P 6

Birthday: January 13, 1987

Citizenship: Mexican

Address: Madrid, Spain

Research interest

I am currently work at the Department of Mathematics, UC3M. My research lies within the field of mathematical and theoretical physics. I am interested in the study of classical and quantum aspects of general relativity, and field theory. But I also make research in atmosphere thermodynamics, percolation theory, and quantum information theory.

Current position

Mathematics department, Universidad Carlos III de Madrid, Spain

UC3M Conex-Plus Marie Curie postdoctoral fellow

March 2021 - PRESENT

Professional Experience

Mathematics department, Universidad Carlos III de Madrid, Spain *UC3M Conex-Plus Marie Curie postdoctoral fellow*

March 2021 - PRESENT

Instituto de Ciencias Nucleares, Universidad Nacional Autónoma de México, Mexico - *DGAPA postdoctoral fellow*

October 2018 - March 2021

Instituto de Estructura de la Materia, Consejo Superior de Investigaciones Científicas, Spain - *CONACyT postdoctoral fellow*

October 2018 - September 2020

Facultad de Ciencias Físico Matemáticas, Benemérita Universidad Autónoma de Puebla, Mexico - *Postdoctoral researcher*

March 2017 - September 2018

EDUCATION

Facultad de Ciencias Físico Matemáticas, Benemérita Universidad Autónoma de Puebla, México - *PhD (Applied Physics)*

August 2012 - January 2017

- Thesis: Geometric approach to Lagrangian systems

Facultad de Ciencias Físico Matemáticas, Benemérita Universidad Autónoma de Puebla, México - *MsC (Applied Physics)*

August 2010 - July 2012

- Thesis: Symplectic structures for continuous systems and fields (in Spanish).
- Distinction: Cum Laude

Facultad de Ciencias Físico Matemáticas, Benemérita Universidad Autónoma de Puebla, México - *B.S (Physics)*

August 2005 - May 2010

- Thesis: Multipole expansion of the electromagnetic fields (in Spanish).
- Distinction: Cum Laude

Member of The National System of Researches (SNI) of CONACYT México: Level I

One periods of 6 years on research work (sexenios) recognized by the Ministry of Education and Science of Spain.

Research funding:

Total amount €72 600

2021-2024 Project title: “Geometric Approach to Physical Field Theories in the Presence of Boundaries”, €72 600 (Euros). Agencia Estatal de Investigación (Madrid, Madrid, ES)

GRANT_NUMBER: PID2020-116567GB-C22

Total amount €27,000.00

2021-2024 Project title: “Geometric Approach to Physical Field Theories in the Presence of Boundaries”, €27,000.00. (Euros). European Union’s Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 801538.

Total amount \$145,000.00

2020 Project title: "Analysis of the spatio-temporal propagation process of COVID-19 in Puebla state", \$145,000.00. (Mexican pesos)

Publications in JCR journals: 19 articles (19 published)

Citations: Google 116, Publons 79

h-index: Google 7, Publons 6

- 1) J. Fernando Barbero G., Marc Basquens, **Bogar Díaz**, and Eduardo J.S. Villaseñor
Poisson brackets in Sobolev spaces: a mock holonomy-flux algebra
PHYSICA SCRIPTA 97 (2022) 125202
DOI: [10.1088/1402-4896/ac99a9](https://doi.org/10.1088/1402-4896/ac99a9)
- 2) J. Fernando Barbero G., **Bogar Díaz**, Juan Margalef-Bentabol, and Eduardo J.S. Villaseñor
Edge observables of the Maxwell-Chern-Simons theory
Physical Review D 106 (2022) 025011
DOI: [10.1103/PhysRevD.106.025011](https://doi.org/10.1103/PhysRevD.106.025011)
- 3) **Bogar Díaz**, Miguel Ángel García-Ariza, and J.E. Ramírez
Adiabatic lapse rate of real gases
Physical Review E 106 (2022) 014108
DOI: [10.1103/PhysRevE.106.014108](https://doi.org/10.1103/PhysRevE.106.014108)
- 4) **Bogar Díaz**, Diego González, Daniel Gutiérrez-Ruiz, and J. David Vergara
Classical analogs of the covariance matrix, purity, linear entropy, and von Neumann entropy
Physical Review A 105 (2022) 062412
DOI: [10.1103/PhysRevA.105.062412](https://doi.org/10.1103/PhysRevA.105.062412)
- 5) J. Fernando Barbero G., Marc Basquens, **Bogar Díaz**, and Eduardo J.S. Villaseñor
Consistent and non-consistent deformations of gravitational theories
Journal of High Energy Physics 05 (2022) 175
DOI: [10.1007/JHEP05\(2022\)175](https://doi.org/10.1007/JHEP05(2022)175)
- 6) Diana Rosales Herrera, J.E. Ramírez, Jorge Velázquez-Castro, **Bogar Díaz**, M. I. Martínez, P. Vázquez Juárez, and A. Fernández Téllez
Mobility strategies based on percolation theory to avoid the spread of diseases: COVID-19
Revista Mexicana de Física 68 (2022) 011701
DOI: [10.31349/RevMexFis.68.011701](https://doi.org/10.31349/RevMexFis.68.011701)
- 7) J. E. Ramírez, **Bogar Díaz** and C. Pajares
Interacting color strings as the origin of the liquid behavior of the quark-gluon plasma
Physical Review D 103 (2021) 094029
DOI: [10.1103/PhysRevD.103.094029](https://doi.org/10.1103/PhysRevD.103.094029)
- 8) J. Fernando Barbero G., **Bogar Díaz**, Juan Margalef-Bentabol, and Eduardo J.S. Villaseñor
Hamiltonian Gotay-Nester-Hinds analysis of the parametrized unimodular extension of the Holst action
Physical Review D 103 (2021) 064062

DOI: [10.1103/PhysRevD.103.064062](https://doi.org/10.1103/PhysRevD.103.064062)

- 9) J. Fernando Barbero G., **Bogar Díaz**, Juan Margalef-Bentabol, and Eduardo J.S. Villaseñor
Concise symplectic formulation for tetrad gravity
Physical Review D 103 (2021) 024051
DOI: [10.1103/PhysRevD.103.024051](https://doi.org/10.1103/PhysRevD.103.024051)
- 10) **Bogar Díaz** and J. E. Ramírez
Adiabatic lapse rate of nonideal gases: The role of molecular interactions and vibrations
Physical Review E 102 (2020) 042197
DOI: [10.1103/PhysRevE.102.042107](https://doi.org/10.1103/PhysRevE.102.042107)
- 11) J. Fernando Barbero G., **Bogar Díaz**, Juan Margalef-Bentabol, and Eduardo J.S. Villaseñor
Generalizations of the Pontryagin and Husain-Kuchař actions to manifolds with boundary
Journal of High Energy Physics 2019 (2019) 121
DOI: [10.1007/JHEP10\(2019\)121](https://doi.org/10.1007/JHEP10(2019)121)
- 12) J. Fernando Barbero G., **Bogar Díaz**, Juan Margalef-Bentabol, and Eduardo J.S. Villaseñor
Dirac's algorithm in the presence of boundaries: a practical guide to a geometric approach
Classical and Quantum Gravity 36 (2019) 205014
DOI: [10.1088/1361-6382/ab436b](https://doi.org/10.1088/1361-6382/ab436b)
- 13) Emilio Alvarez Navarro, **Bogar Díaz**, Miguel Ángel García-Ariza, and J.E. Ramírez.
Effects of the second virial coefficient on the adiabatic lapse rate of dry atmospheres
The European Physical Journal Plus 134 (2019) 458
DOI: [10.1140/epjp/i2019-12826-4](https://doi.org/10.1140/epjp/i2019-12826-4)
- 14) Merced Montesinos, Rodrigo Romero, and **Bogar Díaz**
Symmetries of first-order Lovelock gravity
Classical and Quantum Gravity 35 (2018) 235015
DOI: [10.1088/1361-6382/aaea21](https://doi.org/10.1088/1361-6382/aaea21)
- 15) **Bogar Díaz** and Merced Montesinos
Geometric Lagrangian approach to the physical degree of freedom count in field theory
Journal of Mathematical Physics 59 (2018) 052901
DOI: [10.1063/1.5008740](https://doi.org/10.1063/1.5008740)
- 16) Merced Montesinos, Diego González, Mariano Celada, and **Bogar Díaz**
Reformulation of the symmetries of first-order general relativity
Classical and Quantum Gravity 34 (2017) 205002
DOI: [10.1088/1361-6382/aa89f3](https://doi.org/10.1088/1361-6382/aa89f3)
- 17) **Bogar Díaz**, Daniel Higuera, and Merced Montesinos
Lagrangian approach to the physical degree of freedom count
Journal of Mathematical Physics 55 (2014) 122901

DOI: [10.1063/1.4903183](https://doi.org/10.1063/1.4903183)

- 18) **Bogar Díaz**, Elizabeth Galindo-Linares, Cupatitzio Ramírez-Romero, Gilberto Silva-Ortigoza, Román Suárez-Xique, Gerardo F. Torres del Castillo, and Mercedes Velázquez

Noether symmetries in the phase space

AIP Advances 4 (2014) 097135

DOI: [10.1063/1.4896601](https://doi.org/10.1063/1.4896601)

- 19) **Bogar Díaz** and Gerardo F. Torres del Castillo

Maxwell Equations Solution Using Spin-weighted Spherical Harmonics

AIP Conference Proceedings 1361 (2011) 383

DOI: [10.1063/1.3622733](https://doi.org/10.1063/1.3622733)

Teaching activities:

2017-present: 9 undergraduate courses (Physics and Mathematics programs).

2017-present: 3 graduate courses (master program in Physics).

- Elaboration of three program to the physics grade at BUAP and actualization of one program of the same grade.

Delivered talks at conferences and invited seminars

- 1) Diseño y construcción de un telescopio binocular 2006
Congreso Nacional de Física, Sociedad Mexicana de Física
- 2) Construcción y Caracterización de R 2007
Tercera Gran Semana Nacional de la Matemática, Benemérita Universidad Autónoma de Puebla (BUAP)
- 3) Digitalización de señales analógicas generadas por muones atmosféricos en contadores de centelleo 2007
Congreso Nacional de Física, Sociedad Mexicana de Física
- 4) Reproducción del experimento de Joule 2007
Congreso Nacional de Física, Sociedad Mexicana de Física
- 5) Operadores relacionados con separación de variables 2008
Congreso Nacional de Física, Sociedad Mexicana de Física
- 6) Desarrollo multipolar de los campos electromagnéticos 2010
VIII Taller de la División de Gravitación y Física Matemática, Sociedad Mexicana de Física

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- 7) Un panorama de las teorías con dimensiones extra 2011
Séptima Gran Semana Nacional de la Matemática, Benemérita Universidad Autónoma de Puebla (BUAP)
 - 8) Estructuras simplécticas para sistemas continuos y campos 2012
Octava Gran Semana Nacional de la Matemática, Benemérita Universidad Autónoma de Puebla (BUAP)
 - 9) Symplectic structure for continuous systems and fields 2012
Sociedad Mexicana de Física. IX escuela de la DGFM: Cosmología para el siglo XXI
 - 10) Gravedad linealizada como teoría tipo BF 2013
Invited seminar, Grupo de Geometría y Gravitación del departamento de Física, CINVESTAV-IPN
 - 11) Gravedad Linealizada como teoría tipo BF 2013
Novena Gran Semana Nacional de la Matemática, Benemérita Universidad Autónoma de Puebla (BUAP)
 - 12) Alternative Lagrangian formulations for linearized general relativity 2013
Universidad Autónoma Metropolitana. Mexilazos 2013
 - 13) Simetrías variacionales y no variacionales de $\dot{x} = 0$ 2014
First International Conference on Mathematics and Its Applications, Benemérita Universidad Autónoma de Puebla (BUAP)
 - 14) Lagrangian approach to the physical degree of freedom count 2014
First International Conference on Mathematics and Its Applications, Benemérita Universidad Autónoma de Puebla (BUAP)
 - 15) Lagrangian approach to the physical degree of freedom count 2014
Mexilazos 2014, Benemérita Universidad Autónoma de Puebla (BUAP)
 - 16) Lagrangian approach to the physical degree of freedom count in field theory 2016
Invited seminar, Partículas, Campos y Relatividad General, FCFM- Benemérita Universidad Autónoma de Puebla (BUAP)
 - 17) Reformulation of the symmetries of first-order general relativity 2017
Fourth International Conference on Mathematics and Its Applications, Benemérita Universidad Autónoma de Puebla (BUAP)
 - 18) Transformaciones de norma y relatividad general 2018

Student Seminar, Física-matemática y gravitación, FCFM- Benemérita Universidad Autónoma de Puebla (BUAP)

- 19) Alternative Description of the Gauge Symmetries of General Relativity 2018
Invited seminar, VIII Congreso de Física y Matemáticas, Universidad de las Américas Puebla (UDLAP)
- 20) Descripción alternativa de las simetrías de norma de relatividad general en el formalismo de primer orden 2018
Invited seminar, Centro Universitario de los Valles, Universidad de Guadalajara
- 21) Generalización de la acción de Husain-Kuchar en variedades con fronteras 2019
Invited seminar, Física matemática y Relatividad General—Teoría de campos, gravitación y cosmología—Física de partículas elementales, FCFM- Benemérita Universidad Autónoma de Puebla (BUAP)
- 22) Enfoque geométrico del algoritmo de Dirac en presencia de fronteras espaciales 2019
Invited seminar, Geometria y gravitación, CINVESTAV-Instituto Politécnico Nacional (IPN)
- 23) Geometric formulation to analyze singular physical systems 2021
Eighth International Conference on Mathematics and Its Applications, Benemérita Universidad Autónoma de Puebla (BUAP)
- 24) Teoría de Maxwell-Chern-Simons en variedades con fronteras 2022
Invited seminar, Física de Altas Energías del instituto de Física y el Instituto de ciencias nucleares, ICN-Universidad Nacional Autónoma de México
- 25) Deformaciones consistentes y no consistentes de teorías gravitacionales 2022
Invited seminar, Física Gravitacional y Geométrica, Universidad Veracruzana
- 26) Teoría de Maxwell-Chern-Simons en variedades con frontera 2022
Invited seminar, Workshop Statistical Mechanics in General Relativity, Facultad de Educación, Economía y Tecnología de Ceuta. Universidad de Granada

Posters at conferences

- 1) Maxwell Equations Solution Using Spin-weighted Spherical Harmonics 2009
XII Mexican Workshop on particles and fields, Sociedad Mexicana de Física
- 2) Alternative Lagrangian formulations for linearized general relativity 2014

- 3) Edge observables of the Maxwell-Chern-Simons theory 2022
XXX International Fall Workshop on Geometry and Physics, Instituto of Mathematical Sciences (ICMAT)

Conference organization

- A. Organizer of the *Novena Gran Semana Nacional de la Matemática* (9GSNM) 2013
Benemérita Universidad Autónoma de Puebla
- B. Organizer of the *First International Conference on Mathematics and Its Applications* (1CIMA) 2014
Benemérita Universidad Autónoma de Puebla
- C. Organizer of the *Second International Conference on Mathematics and Its Applications* (2CIMA) 2015
Benemérita Universidad Autónoma de Puebla
- D. Organizer of the *Third International Conference on Mathematics and Its Applications* (3CIMA) 2016
Benemérita Universidad Autónoma de Puebla
- E. Organizer of the *Fourth International Conference on Mathematics and Its Applications* (4CIMA) 2017
Benemérita Universidad Autónoma de Puebla

Other Conferences-Curses attended

- *XII Mexican Workshop on particles and fields* 2009
Sociedad Mexicana de Física
- *Loops 13* 2013
Perimeter Institute
- *Sigrav Graduate School- XI Editionn "Gravity and the Quantum"* 2014
Lake Como school of advanced studies
- *Loops15* 2015
Friedrich-Alexander Universität
- *Fourteenth Marcel Grossmann Meeting* 2015

ICRA

- *Mexican Hat* 2020

IIMAS, UNAM, UAM México

- *Workshop Challenges for Witnessing Quantum Aspects of Gravity in a Lab* 2021

ICRA

- IberiCOS 2021

University of Coimbra and Instituto Superior Técnico, University of Lisbon

- Loops '22 Summer 2022

Centre de Physique Théorique, University Campus of Aix-Marseille-Université

- SIBIA 2022

Congress on industrial solutions based on Artificial Intelligence

- VII Scalar Field Dark Matter Workshop 2022

Universidad de Guanajuato,

- Madrid winter workshop in theoretical physics 2022

Complutense University of Madrid

Committee for revision of theses:

Phd thesis (1),

Bachelor thesis (1),

Short visits (less than a month) to collaborators:

- Universidad Nacional Autónoma de México
- Arkansas State University Campus Queretaro
- Benemérita Universidad Autónoma de Puebla

Referee

AIP Advances

Participation in other activities to promote research and others

- ☐ *Efecto de traslaciones complejas en las funciones especiales* 2012
Programa Jóvenes Investigadores, VIEP-Benemérita Universidad Autónoma de Puebla
- ☐ Referee in *XXIV Concurso Estatal de Aparatos y Experimentos de Física* 2014
División regional de Puebla de la Sociedad Mexicana de Física.
- ☐ Speaker in "Researchers and citizens across Europe" at the EUROPEAN RESEARCHERS' NIGHT 2021, which was held September 24 at Madrid Spain.
- ☐ Reviewer of: Convocatoria2021 Estancias Posdoctorales por México
- ☐ Reviewer of: Convocatoria2022 Estancias Posdoctorales por México
- ☐ Course at the Universidad Carlos III de Madrid: Jornada de gestión y justificación de costes en proyectos europeos de investigación, 2021
- ☐ Course at the Universidad Carlos III de Madrid: Oportunidades de financiación para el desarrollo de la carrera investigadora, 2021
- ☐ Course at the Universidad Carlos III de Madrid: Google workspace en UC3M, 2021
- ☐ Course at the Universidad Carlos III de Madrid: Trastornos psicológicos y/o problemas de conducta, 2021
- ☐ Course at the Universidad Carlos III de Madrid: Training day - horizon Europe ERC proposal starting & consolidator grant preparation, 2022
- ☐ Course at the Universidad Carlos III de Madrid: Doctoral networks and postdoctoral contracts at the Marie Skłodowska-Curie of PM horizon Europe – call 2022, 2022