
Bogar Díaz Jiménez

Personal data

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Publons (P): [G-7210-2019](https://publons.com/author/pub/72102019)
Google citations (G): [Bogar Díaz](#)
Citations: G 123, P 82
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

Marie Curie Researcher

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 2020 - 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*

Facultad de Ciencias Físico Matemáticas, Benemérita Universidad Autónoma de Puebla (BUAP), México – *Research assistant of SIN III (Dr. Gerardo F. Torres del Castillo)*, octubre 2016 - marzo 2017

Facultad de Ciencias Físico Matemáticas, Benemérita Universidad Autónoma de Puebla (BUAP), México – *Research assistant of SIN III (Dr. Gerardo F. Torres del Castillo)*, diciembre 2009 - julio 2010

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

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

ANECA accreditations

- Assistant Doctoral Lecturer
- Contracted Doctoral Lecturer
- Private University professor

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

Awards

- Excellence Scholarship, for performance in carrying out professional studies, 2008 (~€ 500)
- CONACyT Masters Scholarship 2010-2012 (~€ 18 000)
- CONACyT PhD Scholarship 2012-2016 (~€ 40 000)

- CONACyT Posdoctoral Scholarship 2018-2020 (~€ 40 800)
- DGAPA Posdoctoral Scholarship 2020-2021 (~€ 16 700)
- Marie Curie, CONEX-plus, posdoctoral contract 2021-2023 (~€ 200 000)

Research funding:

Total amount \$300 000

2022-2024 Project title: “Información Cuántica en Teorías de Campos y No conmutativas”, \$300 000 (Mexican pesos). Programa de Apoyo a Proyectos de Investigación e Innovación Tecnológica, de la Dirección General de Asuntos del Personal Académico, de la Universidad Nacional Autónoma de México. Grant. IN105422

Total amount €72 600

2021-2024 Project title: “Fields and gravity: boundaries, statistical physics, and memory effects”, €72 600 (Euros). Agencia Estatal de Investigación (Madrid, Madrid, ES)
GRANT_NUMBER: PID2020-116567GB-C22

Total amount €28 200

2021-2024 Project title: “Geometric Approach to Physical Field Theories in the Presence of Boundaries”, €28 200 (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: 21 articles

Citations: Google 124, Publons 82

h-index: Google 7, Publons 6

- 1) **Bogar Díaz**, Diego González, Marcos J. Hernández, and J. David Vergara
Classical analogs of generalized purities, entropies, and logarithmic negativity
Accepted in *Physical Review A*
Arxiv: [2305.02887](https://arxiv.org/abs/2305.02887)
- 2) J. R. Alvarado García, D. Rosales Herrera, A. Fernández Téllez, **Bogar Díaz**, and J. E. Ramírez
Structure of the medium formed in heavy ion collisions
Accepted in *Universe*
Arxiv: [2305.14860](https://arxiv.org/abs/2305.14860)
- 3) 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)

- 4) 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)
- 5) **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)
- 6) **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)
- 7) 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)
- 8) 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)
- 9) 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)
- 10) 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)
- 11) 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)
- 12) **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.102.042197](https://doi.org/10.1103/PhysRevE.102.042197)
- 13) 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)

- 14) 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)
- 15) Emilio Álvarez 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)
- 16) 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)
- 17) **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)
- 18) 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)
- 19) **Bogar Díaz**, Daniel Higueta, 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)
- 20) **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)
- 21) **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: 3 graduate courses (master program in Physics).

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

- 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
- 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

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- 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, Geometría y gravitación, CINVESTAV-Instituto Politécnico Nacional (IPN)
 - 23) Geometric formulation to analyze singular physical systems 2021
Invited seminar, 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

Centre de Physique Théorique. Frontiers of fundamental physics

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 thesis:

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, Classical and Quantum Gravity.

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

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- ❑ 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
 - ❑ EXCELLENCE AND OPEN SCIENCE: Strategies and practices to become an Open Scientist, 2020
 - ❑ PUBLIC SPEAKING AND PROFESSIONAL PRESENTATION FROM A GENDER PERSPECTIVE, 2021
 - ❑ PROTECTION OF INTELLECTUAL PROPERTY AND ITS TRANSFER TO THE COMPANY, 2021
 - ❑ 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