Bogar Díaz Jiménez

Personal data

Email: bodiazj@math.uc3m.es
Personal Email: bogardj@gmail.com
Web page: http://scala.uc3m.es/diazb
Orcid: 0000-0002-0549-5706
Publons (P): G-7210-2019
Google citations (G): Bogar Díaz
Citations: G 151, P 100
h-index: G 7, P 7

Research Interest

I am currently working at the Department of Mathematics, UC3M. My research lies within the field of mathematical and theoretical physics. I am interested in studying classical and quantum aspects of general relativity, and field theory. But I also do research in applications of statistical mechanics [atmosphere thermodynamics, percolation theory], and quantum information theory.

Current position

Mathematics Department, Universidad Carlos III de Madrid, Spain

Marie Curie CONEX-plus Researcher, March 2021 - PRESENT

Professional Experience

Institute of Mathematical Sciences (ICMAT), CSIC-UAM-UC3M-UCM, Spain - *Non-permanent member,* **February 2023 - February 2024**

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**

Mathematics Department-ICUAP, Benemérita Universidad Autónoma de Puebla, Mexico - *Postdoctoral researcher,* **March 2017 - September 2018**

Mathematics Department-ICUAP, Benemérita Universidad Autónoma de Puebla (BUAP), México – *Research assistant of SIN III,* **October 2016 - March 2017**

Mathematics Department-ICUAP, Benemérita Universidad Autónoma de Puebla (BUAP), México – *Research assistant of SIN III,* **December 2009 - July 2010**

EDUCATION

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

August 2012 - January 2017
- Thesis: Geometric approach to Lagrangian systems
- ***Ph.D. equivalency (2023) in the Mathematics program of the Universidad Carlos III de Madrid, Spain***

Facultad de Ciencias Físico Matemáticas, Benemérita Universidad Autónoma de Puebla, México - *MsC (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 (2021-2025)**
- **Candidate (2018-2020)**

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

ANECA accreditations (Spain)

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

Awards

- Excellence Scholarship, for performance in carrying out professional studies, 2008 (~$ 10 000)
- CONACyT Masters Scholarship 2010-2012 (~$ 300 000)
- CONACyT Ph.D. Scholarship 2012-2016 (~$ 720 000)
- CONACyT Postdoctoral (abroad) Scholarship 2018-2020 (~€ 40 800)
- DGAPA Postdoctoral Scholarship 2020-2021 (~$ 400 000)
- Marie Curie CONEX-plus, postdoctoral 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 Sklodowska-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: 20 articles and 1 proceeding

Citations: Google 151, Publons 100

h-index: Google 7, Publons 7

1) **Bogar Díaz**, Diego González, Marcos J. Hernández, and J. David Vergara
   Classical analogs of generalized purities, entropies, and logarithmic negativity
   Physical Review A 108 (2023) 012411
   DOI: 10.1103/PhysRevA.108.012411
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
   Universe 9 (2023) 291
   DOI: 10.3390/universe9060291
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](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
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
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
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
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

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

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

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

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.102.042107

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

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](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

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

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](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](10.1088/1361-6382/aa89f3)

19) **Bogar Díaz**, Daniel Higuita, and Merced Montesinos
Lagrangian approach to the physical degree of freedom count
Journal of Mathematical Physics 55 (2014) 122901
DOI: [10.1063/1.4903183](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](10.1063/1.4896601)

Proceedings

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](10.1063/1.3622733)

Teaching activities:

2017-present: 2 graduate courses (master program in Physics): Classical Mechanics.

2017-present: 10 undergraduate courses (Physics and Mathematics programs): Basic Math, Calculus Concepts, Mechanics II, Calculus II.

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

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
13) Simetrías variacionales y no variacionales de $\ddot{x}= 0$ 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

Invited 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

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 Eduación, Economía y Tecnología de Ceuta. Universidad de Granada

27) Deformaciones consistentes y no consistentes de teorías gravitacionales en tres y cuatro dimensiones 2023

Invited seminar, Benemérita Universidad Autónoma de Puebla

28) Deformaciones consistentes y no consistentes de teoriasgravitacionales en tres y cuatro dimensiones 2023

Invited seminar, Física de Altas Energías del instituto de Física y el Instituto de ciencias nucleares, ICN-Universidad Nacional Autónoma de México

29) Formulación geométrica del algoritmo de Dirac en presencia de fronteras 2023

Invited Mini-course, Mexilazos 2023, Universidad Autónoma Metropolitana.

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)
4) Edge observables and states of the Maxwell-Chern-Simons theory 2023 Puzzles in the Quantum Gravity Landscape: viewpoints from different approaches, Perimeter Institute for Theoretical Physics

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

● *Spacetime is as spacetime does: pro and contra 2023* University of Florence

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, Journal of Physics A: Mathematical and Theoretical.

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 dePuebla

❏ Referee in *XXIV Concurso Estatal de Aparartos 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 in 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

❏ Curse at the Universidad Carlos III de Madrid: Jornada de gestión y justificación de costes en proyectos europeos de investigación, 2021

❏ Curse at the Universidad Carlos III de Madrid: Oportunidades de financiación para el desarrollo de la carrera investigadora, 2021

❏ Curse at the Universidad Carlos III de Madrid: Google workspace en UC3M, 2021

❏ Curse at the Universidad Carlos III de Madrid: Trastornos psicológicos y/o problemas de conducta, 2021

❏ Curse at the Universidad Carlos III de Madrid: Training day - horizon Europe ERC proposal starting & consolidator grant preparation, 2022

❏ Curse at the Universidad Carlos III de Madrid: Doctoral networks and postdoctoral contracts at the Marie Skłodowska-Curie of PM horizon Europe – call 2022, 2022

Languages

Spanish: Native
English: C1
Italian: B1