

Asier López-Gordón

PREDOCTORAL RESEARCHER

*Institute of Mathematical Sciences (ICMAT), Spanish National Research Council (CSIC)
Calle Nicolás Cabrera, 13-15, Campus Cantoblanco, UAM, 28049 Madrid, Spain*

✉ asier.lopez@icmat.es | 🏠 alopezgordon.xyz | ☎ 0000-0002-9620-9647

Education

Autonomous University of Madrid

Madrid, Spain

PHD MATHEMATICS

2021 -

- PhD thesis: The geometry of dissipation
- Advisor: Manuel de León

Autonomous University of Madrid

Madrid, Spain

MSc THEORETICAL PHYSICS

2020 - 2021

- MSc thesis: The geometry of Rayleigh dissipation (arXiv:[2107.03780](https://arxiv.org/abs/2107.03780))
- Advisor: Manuel de León

Complutense University of Madrid

Madrid, Spain

BSc PHYSICS

2016 - 2020

- BSc thesis: Integrability, chaos and entanglement in quantum systems
- Advisors: Federico Finkel and Artemio González-López

Professional Experience

2021-

Predoctoral researcher, Institute of Mathematical Sciences (ICMAT), Spanish National Research Council (CSIC), Madrid, Spain

2020-2021

“JAE Intro” research grantee, Institute of Mathematical Sciences (ICMAT), Spanish National Research Council (CSIC), Madrid, Spain

Research stays

February-

Department of Mathematical Methods in Physics (KMMF), University of Warsaw, Poland, collaborated with

May 2023

Professor Javier de Lucas and Bartosz M. Zawora

Research Publications

JOURNAL ARTICLES

- J. Gaset, A. López-Gordón and X. Rivas, “Symmetries, conservation and dissipation in time-dependent contact systems”, *Fortschr. Phys.* **71** (8-9), 2300048 (May 2023), doi: [10.1002/prop.202300048](https://doi.org/10.1002/prop.202300048) (Open Access).
- M. de León, M. Lainz, A. López-Gordón and X. Rivas, “Hamilton-Jacobi theory and integrability for autonomous and non-autonomous contact systems”, *J. Geom. Phys.* **187** (Feb. 2023), doi: [10.1016/j.geomphys.2023.104787](https://doi.org/10.1016/j.geomphys.2023.104787) (Open Access).
- L. Colombo, M. de León and A. López-Gordón, “Contact Lagrangian systems subject to impulsive constraints”, *J. Phys. A: Math. Theor.* **55**(42) (Oct. 2022), doi: [10.1088/1751-8121/ac96de](https://doi.org/10.1088/1751-8121/ac96de).
- M. de León, M. Lainz and A. López-Gordón, “Discrete Hamilton–Jacobi theory for systems with external forces”, *J. Phys. A: Math. Theor.* **55**(20) (Mar. 2022), doi: [10.1088/1751-8121/ac6240](https://doi.org/10.1088/1751-8121/ac6240).
- M. de León, M. Lainz and A. López-Gordón, “Geometric Hamilton–Jacobi theory for systems with external forces”, *J. Math. Phys.* **63**(2): 022901 (Feb. 2022), doi: [10.1063/5.0073214](https://doi.org/10.1063/5.0073214) (Open Access).
- M. de León, M. Lainz and A. López-Gordón, “Symmetries, constants of the motion, and reduction of mechanical systems with external forces”, *J. Math. Phys.* **62**(4): 042901 (Apr. 2021), doi: [10.1063/5.0045073](https://doi.org/10.1063/5.0045073).

CONFERENCE PAPERS

- M. de León, M. Lainz, A. López-Gordón and J. C. Marrero, “Nonholonomic brackets: Eden revisited”, *Geometric Science of Information. GSI 2023. Lecture Notes in Computer Science*, vol. 14072. Springer, Cham, doi: [10.1007/978-3-031-38299-4_12](https://doi.org/10.1007/978-3-031-38299-4_12).
- A. A. Simoes, A. López-Gordón, A. Bloch and L. Colombo, “Discrete Mechanics and Optimal Control for a Passive Walker Experiencing Foot Slip”, *2023 American Control Conference (ACC)*, pp. 4587–4592 (July 2023), doi: [10.23919/ACC55779.2023.10156020](https://doi.org/10.23919/ACC55779.2023.10156020).
- A. López-Gordón, L. Colombo and M. de León, “Nonsmooth Herglotz principle”, *2023 American Control Conference (ACC)*, pp. 3376–3381 (July 2023), doi: [10.23919/ACC55779.2023.10156228](https://doi.org/10.23919/ACC55779.2023.10156228).
- M. E. E. Irazú, A. López-Gordón, L. J. Colombo and M. de León, “Hybrid Routhian reduction for simple hybrid forced Lagrangian systems”, *2022 European Control Conference (ECC)*, pp. 345–350 (July 2022), doi: [10.23919/ECC55457.2022.9838077](https://doi.org/10.23919/ECC55457.2022.9838077).

PREPRINTS

- M. de León, M. Lainz, A. López-Gordón and J. C. Marrero, “A new perspective on nonholonomic brackets and Hamilton-Jacobi theory” (July 2023), [arXiv:2307.06049](https://arxiv.org/abs/2307.06049) [math-ph].
- L. Colombo, M. de León, M. Lainz and A. López-Gordón, “Liouville-Arnold theorem for contact Hamiltonian systems” (Feb. 2023), [arXiv:2302.12061](https://arxiv.org/abs/2302.12061) [math.SG].
- L. Colombo, M. de León, M. E. Eyrea Irazú and A. López-Gordón, “Geometric Hamilton-Jacobi theory and integrability for nonholonomic and forced hybrid systems” (Nov. 2022), [arXiv:2211.06252](https://arxiv.org/abs/2211.06252) [math-ph].
- L. J. Colombo, M. de León, M. E. Eyrea Irazú and A. López-Gordón, “Generalized hybrid momentum maps and reduction by symmetries of forced mechanical systems with inelastic collisions” (June 2022), [arXiv:2112.02573](https://arxiv.org/abs/2112.02573) [eess.SY].

IN PREPARATION

- J. de Lucas, A. López-Gordón and B. M. Zawora, “Dissipation, stability, and contact Hamiltonian systems”.
- A. López-Gordón and L. Colombo, “On the integrability of hybrid Hamiltonian systems”.

Awards, Fellowships, & Grants

| | | |
|------|--|---------|
| 2021 | “FPI” predoctoral contract, Ministerio de Ciencia e Innovación | |
| | “JAE Intro” Grant extension, Instituto de Ciencias Matemáticas (ICMAT) | 3 000 € |
| 2020 | “JAE Intro” Grant, Consejo Superior de Investigaciones Científicas (CSIC) | 3 000 € |
| 2019 | “Beca de Colaboración en Departamentos”, Universidad Complutense de Madrid | 2 000 € |

Talks and Posters

CONTRIBUTED TALKS

- December 11, 2023. **deLeonfest 2023. An interdisciplinary conference on geometric mechanics and related fields.** *Integrability of contact Hamiltonian systems.* Institute of Mathematical Sciences (ICMAT), Madrid, Spain. Co-presented with Manuel Lainz
- June 2, 2023. **2023 American Control Conference.** *Nonsmooth Herglotz variational principle.* San Diego, California, USA.
- March 29, 2023. **17th International Young Researchers Workshop on Geometry, Mechanics and Control.** *Liouville-Arnold theorem for contact Hamiltonian systems.* KU Leuven, Leuven, Belgium.
- February 6, 2023. **VI Congreso de Jóvenes Investigadores de la Real Sociedad Matemática Española.** *Integrability of contact Hamiltonian systems.* Universidad de León, León, Spain.
- January 19, 2023. **XXIV Encuentro de Invierno en Geometría, Mecánica y Control.** *Symmetries, conservation and dissipation in time-dependent contact systems.* Universidad de Zaragoza, Zaragoza, Spain.
- January 6, 2023. **Workshop on Nonlinear Systems III.** *Symmetries, conservation and dissipation in time-dependent contact systems.* Gebze Teknik Üniversitesi, Kocaeli, Turkey.

- September 1, 2022. **XXX International Fall Workshop in Geometry and Physics.** *Hamilton-Jacobi theory for contact systems: autonomous and non-autonomous.* Instituto de Ciencias Matemáticas (ICMAT-CSIC), Madrid, Spain.
- July 20, 2022. **34th International Colloquium on Group Theoretical Methods in Physics.** *Non-conservative systems can have conserved quantities! Symmetries, reduction and Hamilton-Jacobi theory for forced mechanical systems.* Strasbourg University, Strasbourg, France.
- July 13, 2022. **2022 European Control Conference.** *Hybrid Forced Lagrangian Systems.* Imperial College and University College, London, UK (online).
- July 5, 2022. **14th International Summer School on Geometry, Mechanics and Control.** *Reduction of forced mechanical systems with inelastic collisions.* Universidad de Burgos, Burgos, Spain.
- March 7-11, 2022. **VII Iberoamerican Meeting on Geometry, Mechanics and Control.** *Forced Hamiltonian and Lagrangian systems. Symmetries, reduction and Hamilton-Jacobi theory.* Departamento de Matemática, Universidad Nacional del Sur, Bahía Blanca, Argentina (online).
- September 8, 2021. **XXIX International Fall Workshop in Geometry and Physics.** *Mechanical systems with external forces. Symmetries, reduction and Hamilton-Jacobi theory.* Centro de Matemática e Aplicações, Universidade da Beira Interior, Covilhã, Portugal (online).

SEMINARS AND COLLOQUIA

- May 24, 2023. **Joint Mathematics Junior Colloquium (ICMAT-UAM-UC3M-UCM).** *Cómo la geometría nos permite entender la dinámica: una introducción a los sistemas integrables.* Instituto de Ciencias Matemáticas, Madrid, Spain.
- May 11, 2023. **Geometry and Applications: Modern Mathematical Approaches (Gamma) Seminar.** *An introduction to integrable systems.* University of Warsaw, Warsaw, Poland (online).
- April 1, 2022. **Geometry, Mechanics and Control Seminar.** *Reduction, Hamilton-Jacobi theory and discretization of mechanical systems with external forces.* Instituto de Ciencias Matemáticas, Madrid, Spain (online).

POSTERS

- July 10, 2023. **XV International ICMAT Summer School on Geometry, Dynamics and Field theory.** *Liouville–Arnold theorem for contact Hamiltonian systems.* La Cristalera, Miraflores de la Sierra, Madrid, Spain.
- January 17-21, 2022. **Congreso Bienal de la Real Sociedad Matemática Española** (Biennial Congress of the Royal Spanish Mathematical Society). *Systems with external forces. Symmetries, reduction and Hamilton-Jacobi theory.* Universidad de Castilla – La Mancha, Ciudad Real, Spain.
- December 1-3, 2021. **Young Researchers Workshop in Geometry, Mechanics and Control.** *Symmetries, reduction, Hamilton-Jacobi theory and discretization for systems with external forces.* Centre de Recerca Matemàtica, Campus de Bellaterra, Barcelona, Spain.

Assistance to scientific meetings _____

WORKSHOPS

- December 11-13, 2023. **deLeonfest 2023. An interdisciplinary conference on geometric mechanics and related fields.** Institute of Mathematical Sciences (ICMAT), Madrid, Spain.
- July 12-14, 2023. **Dynamical Systems, Mechanics and Control. A workshop in honor to Anthony Bloch.** La Cristalera, Miraflores de la Sierra, Madrid, Spain.
- July 5-7, 2023. **Environmental Monitoring: An Exploratory Workshop.** Spanish Royal Academy of Sciences, Madrid, Spain.
- May 31-June 2, 2023. **2023 American Control Conference.** San Diego, California, USA.
- March 29-31, 2023. **17th International Young Researchers Workshop on Geometry, Mechanics and Control.** KU Leuven, Leuven, Belgium.
- February 6-10, 2023. **VI Congreso de Jóvenes Investigadores de la Real Sociedad Matemática Española.** Universidad de León, León, Spain.
- January 19-20, 2023. **XXIV Encuentro de Invierno en Geometría, Mecánica y Control.** Universidad de Zaragoza, Zaragoza, Spain.

January 3-9, 2023. **Workshop on Nonlinear Systems III.** Gebze Teknik Üniversitesi, Kocaeli, Turkey.

December 12-16, 2022. **II Encuentro RSME-UMA.** Ronda, Spain.

August 29-September 2, 2022. **XXX International Fall Workshop in Geometry and Physics.** Instituto de Ciencias Matemáticas (ICMAT-CSIC), Madrid, Spain.

July 18-22, 2022. **34th International Colloquium on Group Theoretical Methods in Physics.** Strasbourg University, Strasbourg, France.

July 12-15, 2022. **2022 European Control Conference.** Imperial College and University College, London, UK (online).

May 23-26, 2022. **Geometric Aspects of the Swampland.** Centro de Física Teórica y Matemáticas, Madrid, Spain.

March 7-11, 2022. **VII Iberoamerican Meeting on Geometry, Mechanics and Control.** Departamento de Matemática, Universidad Nacional del Sur, Bahía Blanca, Argentina (online).

January 24-25, 2022. **XXIII Winter Meeting on Geometry, Mechanics and Control.** Universidad de Zaragoza, Zaragoza, Spain.

January 17-21, 2022. **Congreso Bienal de la Real Sociedad Matemática Española** (Biennial Congress of the Royal Spanish Mathematical Society). Universidad de Castilla – La Mancha, Ciudad Real, Spain.

December 1-3, 2021. **Young Researchers Workshop in Geometry, Mechanics and Control.** Centre de Recerca Matemàtica, Campus de Bellaterra, Barcelona, Spain.

September 7-10, 2021. **XXIX International Fall Workshop in Geometry and Physics.** Centro de Matemática e Aplicações, Universidade da Beira Interior, Covilhã, Portugal (online).

July 26-30, 2021. **Symposium on New Developments in Momentum Polytope Theory.** Instituto de Ciencias Matemáticas (ICMAT), Madrid, Spain (online).

February 18-19 2021. **XXII Winter Meeting on Geometry, Mechanics and Control.** Universidade de Santiago de Compostela, Santiago de Compostela, Spain (online).

December 1-3, 2020. **BYMAT Conference-Bringing Young Mathematicians Together.** Universitat de València and Universitat Politècnica de València, Valencia, Spain (online).

SCHOOLS

July 10-11, 2023. **XV International ICMAT Summer School on Geometry, Dynamics and Field theory.** La Cristalera, Miraflores de la Sierra, Madrid, Spain.

July 4-8, 2022. **14th International Summer School on Geometry, Mechanics and Control.** Universidad de Burgos, Burgos, Spain.

August 2-5, 2021. **Summer School on New Developments in Momentum Polytope Theory.** Instituto de Ciencias Matemáticas (ICMAT), Madrid, Spain (online).

June 21-July 9, 2021. **JAE School of Mathematics.** Instituto de Ciencias Matemáticas (ICMAT), Madrid, Spain.

January 25-February 5, 2021. **Master School on Geometry, Analysis and Applications.** Universidad de Cantabria, Santander, Spain (online).

September 7-9, 2020. **JAE School of Mathematics.** Instituto de Ciencias Matemáticas (ICMAT), Madrid, Spain (online).

July 1-5 2019. **I International School on Particle Physics and Cosmology.** Universidad Internacional Menéndez Pelayo, Santander, Spain.

OTHERS

June 1, 2022. **Conferencia Final Net4impact. Impacto Social De La Investigación Científica.** Instituto de Ciencias Matemáticas, Madrid, Spain.

Teaching Experience _____

| | | |
|---------------------|--|------|
| Winter 2023-24 | Mathematics I , Teaching Assistant, Degree in Biomedical Engineering, Autonomous University of Madrid | 30 h |
| Winter 2023-2024 | Mathematics , Teaching Assistant, Degree in Biochemistry, Autonomous University of Madrid | 30 h |
| Winter 2022-23 | Mathematics , Teaching Assistant, Degree in Food Science and Technology and Double Degree in Human Nutrition and Dietetics and FST, Autonomous University of Madrid | 30 h |
| Winter 2022-2023 | Mathematics , Teaching Assistant, Degree in Biochemistry, Autonomous University of Madrid | 30 h |

Outreach & Professional Development _____

POPULAR SCIENCE ARTICLES

A. López-Gordón and A. Timón García-Longoria, “Los misterios de la cicloide, una de las curvas más presentes en la naturaleza”, *El País*, June 19, 2023, <https://elpais.com/ciencia/cafe-y-teoremas/2023-06-19/los-misterios-de-la-cicloide-una-de-las-curvas-mas-presentes-en-la-naturaleza.html>. Accessed October 31, 2023.

ORGANIZATION OF SCIENTIFIC MEETINGS

Member of the Scientific Committee of the *5th BYMAT Conference*, held at the Institute of Mathematical Sciences in Madrid (Spain) from November 13 to November 16, 2023.

Member of the Organizing Committee of *Environmental Monitoring: An Exploratory Workshop*, held at the Spanish Royal Academy of Sciences from July 5 to July 7, 2023.

Organizer of the parallel session on *Differential Geometry, Mathematical Physics and Control Theory*, during the *VI Congreso de Jóvenes Investigadores de la Real Sociedad Matemática Española*, held at the University of León (Spain) on February 9, 2023.

PEER REVIEW

Advances in Mathematical Physics

International Journal of Geometric Methods in Modern Physics

Journal of Geometric Mechanics

Journal of Physics A: Mathematical and Theoretical

Mediterranean Journal of Mathematics

Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales. Serie A. Matemáticas

6th International Conference on Geometric Science of Information

61st IEEE Conference on Decision and Control

PROFESSIONAL MEMBERSHIPS

Real Sociedad Matemática Española (Royal Spanish Mathematical Society)

Real Sociedad Española de Física (Spanish Royal Physics Society)

Languages _____

English. Advanced, C1 in the CEFR, 7.5 band score in IELTS Academic

Spanish. Mother tongue

Computer skills _____

Advanced. \LaTeX , GNU/Linux, macOS, Mathematica, Python, Windows

Basic. bash/shell, Excel, git, gnuplot, html, Julia, matlab, nginx, OriginLab, SciDAVis