# Alberto Molgado

Curriculum vitae

May 3, 2022

## PERSONAL DETAILS


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| DATE OF BIRTH: | 7 November, 1976. |
| PLACE OF BIRTH: | Saltillo, Coahuila, México. |
| NATIONALITY: | Mexican. |
| CURP: | MORA761107HCLLML07 |
| RFC: | MORA7611078Z1 |
| ADDRESS: | Facultad de Ciencias, Universidad Autónoma de San Luis Potosi<br>Av. Salvador Nava S/N, San Luis Potosi, SLP 78290 Mexico. |
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## IDENTIFIERS


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Scopus Author ID: 22235024300
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Google Scholar id: YgpgxfwAAAAJ


## PROFESSIONAL EXPERIENCE

- July 2011- Present day — Profesor-Investigador VI, Facultad de Ciencias, Universidad Autonoma de San Luis Potosi, Mexico
- January 2008-June 2011 — Profesor Titular A, Unidad Academica de Fisica, Universidad Autonoma de Zacatecas, Mexico
- August 2007-December 2007 — Profesor Titular A, Facultad de Ciencias, Universidad de Colima, Mexico.
- August 2005-July 2007 — Postdoctoral Fellow, Facultad de Ciencias, Universidad de Colima, Mexico.

## EDUCATION

- DEGREE: PhD Mathematics (2005)
  INSTITUTION: School of Mathematical Sciences, University of Nottingham, UK.
  DISSERTATION: Refined algebraic quantisation: Finite dimensional systems.
  SUPERVISOR: Jorma Louko
- DEGREE: Maestría en Ciencias-Física (MSc) (2001)
  INSTITUTION: Instituto de Física, UASLP, Mexico.
- DEGREE: Licenciatura en Ciencias-Física (BSc) (1999)
  INSTITUTION: Facultad de Ciencias, UASLP, México.

## LIST OF PUBLICATIONS

### Research articles

[1] J. Berra-Montiel and A. Molgado, *Tomography in Loop Quantum Cosmology*, Eur. Phys. J. Plus **137** 283 (2022), arXiv:2104.09721

[2] J. Berra-Montiel, A. Molgado and A. Rodríguez-López, *A review on geometric formulations for classical field theory: the Bonzom-Livine model for gravity*, Class. Quantum Grav. **38** 135012 (2021), arXiv:2101.08960 [gr-qc].

[3] A. Molgado and E. Rojas, *Hamiltonian dynamics of gonihedric string theory*, Int. J. Mod. Phys. **A36** 2150035 (2021), arXiv:2012.13358 [hep-th].

[4] J. Berra-Montiel, E. Castellanos, A. Molgado and J. Trinidad-García, *Superfluids in Polymer Quantum Mechanics*, Mod. Phys. Lett. **A36** 2150045 (2021), arXiv:2006.14747 [gr-qc].

[5] J. Berra-Montiel and A. Molgado, *Quasi-probability distributions in Loop Quantum Cosmology*, Class. Quantum Grav. **37** 215003 (2020), arXiv:2007.01324 [gr-qc]

[6] J. Berra-Montiel and A. Molgado, *Coherent representation of fields and deformation quantization*, Int. J. Geom. Methods Mod. Phys. **17** 2050166 (2020), arXiv:2005.14333 [quant-ph].

[7] A. Aguilar-Salas, A. Molgado and E. Rojas, *Hamilton-Jacobi approach for Regge-Teitelboim cosmology*, Class. Quantum Grav. **37** 145003 (2020), arXiv:2004.01650 [gr-qc].

[8] J. Berra-Montiel and A. Molgado, *Deformation quantization of constrained systems: a group averaging approach*, Class. Quantum Grav. **37** 055009 (2020), arXiv:1911.00945 [gr-qc].

[9] A. Molgado and A. Rodríguez-López, *Covariant momentum map for non-Abelian topological BF field theory*, Class. Quantum Grav. **36** 245003 (2019) arXiv:1907.01152 [gr-qc].

[10] J. Berra-Montiel, A. Molgado and A. Rodríguez-López, *Polysymplectic formulation for BF gravity with Immirzi parameter*, Class. Quantum Grav. **36** 115003 (2019), arXiv:1901.11532 [gr-qc].

[11] J. Berra-Montiel and A. Molgado, *Polymer Quantum Mechanics as a Deformation Quantization*, Class. Quantum Grav. **36** 025001 (2019), arXiv:1805.05943 [gr-qc].

[12] J. Berra-Montiel and A. Molgado, *Polymeric quantum mechanics and the zeros of the Riemann zeta function*, Int. J. Geom. Meth. Mod. Phys. **15** 1850095 (2018), arXiv:1610.01957v1 [math-ph].

[13] A. Molgado, O. Morales and J. A. Vallejo, *Virtual beams and the Klein paradox for the Klein-Gordon equation*, Rev. Mex. Fís. **E64** 1 (2018) arXiv:1602.00190 [quant-ph].

[14] J. Madrigal-Melchor, J. Martínez-Montoya, A. Molgado and J. R. Suárez-López, *Unruh effect detection through chirality in curved graphene*, Eur. Phys. J. Plus **132** 523 (2017), arXiv:1705.03052 [hep-th].

[15] J. Berra-Montiel, A. Molgado and D. Serrano-Blanco, *De Donder-Weyl Hamiltonian formalism of MacDowell-Mansouri gravity*, Class. Quantum Grav. **34** 235002 (2017), arXiv:1703.09755 [gr-qc].

[16] J. Berra-Montiel, E. del Río and A. Molgado, *Polysymplectic formulation for topologically massive Yang-Mills field theory*, Int. J. Mod. Phys. **A32** 1750101 (2017), arXiv:1702.03076v2 [hep-th].

[17] J. Berra-Montiel, J. Martínez-Montoya and A. Molgado, *The Unruh effect for higher derivative field theory*, Class. Quantum Grav. **34** 075007 (2017), arXiv:1612.07344 [gr-qc].

[18] M. Cruz, R. Gómez-Cortés, A. Molgado and E. Rojas, *Hamiltonian analysis for linearly acceleration-dependent Lagrangians*, J. Math. Phys. **57** 062903 (2016), arXiv:1310.5750v2 [math-ph].

[19] J. Berra-Montiel, A. Molgado and C. D. Palacios-García, *Causal Poisson bracket via Deformation Quantization*, Int. J. Geom. Meth. Mod. Phys. **13** 1650104 (2016), arXiv:1408.2796v2 [hep-th] .

[20] J. Berra-Montiel, A. Molgado and E. Rojas, *Deformation quantization of the Pais-Uhlenbeck fourth order oscillator*, Ann. Phys. **362** 298 (2015), arXiv:1505.02866 [quant-ph].

[21] R. Cordero, M. Cruz, A. Molgado and E. Rojas, *Quantum modified Regge-Teitelboim cosmology*, Gen Rel. Grav. **46** 1761 (2014), arXiv:1309.3031v1 [gr-qc].

[22] E. Lopez, A. Molgado and J. A. Vallejo, *The principle of stationary action in the calculus of variations*, Commun. Math. **20** 89 (2012), arXiv:1205.0865v1 [math-ph].

[23] R. Cordero, M. Cruz, A. Molgado and E. Rojas, *Modified geodetic brane cosmology*, Class. Quantum Grav. **29** 175010 (2012), arXiv:1109.2332 [gr-qc].

[24] R. Cordero, A. Molgado and E. Rojas, *Quantum charged rigid membrane*, Class. Quantum Grav. **28** 065010 (2011), arXiv:1012.1379v2 [gr-qc].

[25] R. Cordero, A. Molgado and E. Rojas, *Ostrogradski approach for the Regge–Teitelboim type cosmology*, Phys. Rev. **D79**, 024024 (2009), arXiv:0901.1938v1 [gr-qc].

[26] R. Cordero, A. Molgado and E. Rojas, *Dynamics of Born-Infeld membranes*, J. Phys.: Conf. Ser. **91**, 012008 (2007).

[27] A. Molgado and A. Rodríguez, *Mapping between the dynamic and mechanical properties of the relativistic oscillator and Euler free rigid body*, J. Nonlinear Math. Phys. **14**, 526 (2007).

[28] R. Cordero, A. Molgado and E. Rojas, *Geometrical dynamics of Born-Infeld* objects, Class. Quantum Grav. **24**, 1665 (2007), arXiv:hep-th/0702065.

[29] A. Molgado, *Group averaging and the Ashtekar-Horowitz model*, Rev. Mex. Fís. **S53**, 121 (2007).

[30] J. Louko, and A. Molgado, *Superselection sectors in the Ashtekar-Horowitz-Boulware model*, Class. Quantum Grav. **22**, 4007 (2005), arXiv:gr-qc/0505097.

[31] J. Louko, and A. Molgado, *Refined algebraic quantisation with the triangular subgruop of* $\mathrm{SL}(2,\mathbb{R})$, Int. J. Mod. Phys. **D14**, 1131 (2005), arXiv:gr-qc/0404100.

[32] J. Louko, and A. Molgado, *Group averaging in the* $(p,q)$ *oscillator representation of* $\mathrm{SL}(2,\mathbb{R})$, J. Math. Phys. **45**, 1919 (2004), arXiv:gr-qc/0312014.

## Books and book chapters

[1] V. V. Dvoeglazov and A. Molgado (eds), *Progress in Relativity, Gravitation, Cosmology*, in *Contemporary Fundamental Physics* Book Series (Nova Science Publishers, USA, 2012) ISBN: 978-1-61324-811-9.

[2] V. V. Dvoeglazov, A. Molgado and C. Ortiz (eds), *The Mathematical Beauty of Symmetry*, *Proceedings of the 2010 Workshop on Mathematical Physics II, Mexico*, special issue of the *Electronic Journal of Theoretical Physics* (2011) ISSN 1729-5254.

[3] R. Cordero, A. Molgado and E. Rojas, *Quantum and semiclassical aspects of the rigid Dirac membrane with tension*, Chapter VIII in *Progress in Relativity, Gravitation and Cosmology: Contemporary fundamental physics book series* (Nova Science Publishers, NY, 2011).

## Proceedings

[1] J. Berra-Montiel, A. Molgado and D. Serrano-Blanco, *Moyal product for* $(n-1)$*-forms within the covariant Hamiltonian formalism for fields*, J. Phys: Conf. Series **1030** 012002 (2018).

[2] R. Cordero, A. Molgado and E. Rojas, *Ostrogradski approach for the Regge-Teitelboim model*, in Proceedings of the Twelfth Marcel Grossmann Meeting on General Relativity: *Recent Developments in Theoretical and Experimental General Relativity, Astrophysics, and Relativistic Field Theories*, pp. 1986–1988, T. Damour, R. T. Jantzen and R. Ruffini eds. (World Scientific, Singapore, 2012).

[3] A. Molgado, *Boundary terms in cosmological models and their quantization*, in *The Mathematical Beauty of Symmetry*, EJTP **PS8**, pp. 95–106, *Proceedings of the 2010 Workshop on Mathematical Physics II, Mexico*, V. Dvoeglazov, A. Molgado, and C. Ortiz eds. (2011).

[4] R. Cordero, A. Molgado and E. Rojas, *Ostrogradski Hamiltonian approach for geodetic brane gravity* in *AIP Conference Proceedings* **1318***, pp. 216–223, Recent developments in Gravitation and BEC'S phenomenology: IV Mexican Meeting on Experimental and Theoretical Physics*, A. Macias and M. Maceda eds. (Mexico City, 2010).

[5] R. Cordero, A. Molgado and E. Rojas, *Dynamics of Born-Infeld membranes* J. Phys.: Conf. Ser. **91** 012008 (2007).

[6] R. Cordero, A. Molgado and E. Rojas, *Dynamics of Born-Infeld objects* in *Proceedings of the XXVI International Colloquium on Group Theoretical Methods in Physics (Group 26), pp. 168–172*, J. L. Birman, S. Catto and B. Nicolescu eds. (Canopus books, New York, 2006).

[7] J. Louko and A. Molgado, *Group averaging in the* $(p,q)$ *oscillator representation of* $\mathrm{SL}(2,\mathbb{R})$ in *General Relativity And Gravitation: Proceedings of the 17th International Conference*, P. Florides, B. Nolan and A. Ottewill eds. (Dublin, 2004).

## Preprints

[1] J. Berra-Montiel and A. Molgado, *Integral representation of the star product in Loop Quantum Cosmology* (2020), `arXiv:2010.08711 [gr-qc]`.

## RESEARCH GRANTS

- *Classical and quantum aspects of Cosmological models.* Investigador responsable de proyecto posdoctoral del Dr Pedro Isaac Ramírez Baca. 2020-2022 CONACYT
- *Apoyo a Perfil deseable Prodep.* 2019 PRODEP-UASLP
- *Multisymplectic structures and their algebraic quantisation.* 2015–2019 Conacyt Ciencia Básica.
- *Geometric analysis for Horava-like models and its quantization by algebraic methods.* 2012–2013 PROMEP-UASLP.
- *Refined algebraic quantization for unitary groups associated to Kac-Moody algebras.* 2008–2010 PROMEP-UAZ.
- *Constrained systems quantization in quantum field theory by means of the group averaging method.* 2008–2010 CONACyT-UAZ.
- *Refined algebraic quantization and physics beyond the standard model.* 2006–2007 CONACyT-UCol.

## ACADEMIC MEMBERSHIPS

- Associate member of the DUAL CP Institute of High Energy Physics since September 2009.
- Affiliate member of the American Mathematical Society since May 2008.
- Member of the Mexican Physics Society (SMF) 2018–2019.

## PROFESSIONAL SERVICE

- Referee for *Nuclear Physics B* (Elsevier), *Classical and Quantum Gravity* (Institute of Physics), *Modern Physics Letters A* (World Scientific), *Universe* (Multidisciplinary Digital Publishing Institute), *Journal of Physics A: Mathematical and Theoretical* (Institute of Physics), *International Journal of Geometric Methods in Modern Physics* (World Scientific), *Journal of Physics Communications* (Institute of Physics), *Journal of Mathematical Physics* (American Institute of Physics), *International Journal of Modern Physics A* (World Scientific), *Canadian Journal of Physics* (Canadian Science Publishing), *European Journal of Physics* (Institute of Physics), *Frontiers in Mathematical Physics* (Frontiers), *Progress in Applied Mathematics* (Canadian Research & Development Center of Sciences and Cultures), *Contemporary Fundamental Physics* Book Series (Nova Science Publishers), *zbMATH* (European Mathematical Society), *Mathematical Reviews* (American Mathematical Society).

- Referee for Mexican Science Academy (AMC) (Summer Research program (2019, 2018, 2017)).
- Member of committees and/or referee for CONACyT–Mexico (Basic Science (2020, 2019, 2018, 2015, 2014, 2013, 2012, 2011), Posdoctoral fellowships (2020), Conacyt Mexico-DFG Germany (2017), National problems (2016), International Scholarships (2014, 2013)).
- Member of committees and referee for PRODEP–Mexico (Individual and Scientific groups applications (2015, 2014)).
- Leader of the Academic group on Applied Mathematics and Theoretical Physics CA-UASLP-200 (February, 2014–Present day).

## DISTINCTIONS

- IOP Trusted Reviewer Status (top 15% of reviewers), by Institute of Physics, UK, 23 December, 2021
- SNI I (January 2010–December 2024), SNI Candidate (January 2007–December 2009)
- Perfil PROMEP UASLP, July 2013–present day
- PROMEP-UASLP NPTC, June 2012–June 2014
- Perfil PROMEP UAZ, August 2010–July 2011
- PROMEP-UAZ NPTC, September 2008–February 2011
- CONACYT Retention program to the Universidad Autónoma de Zacatecas, January 2008
- CONACYT Postdoctoral Fellowship to the Universidad de Colima, September 2005–August 2006
- ORS Award to the University of Nottingham, Universities UK, September 2001–August 2004
- CONACYT PhD Scholarship Fund to the University of Nottingham, October 2001–September 2004
- CONACYT MSc Scholarship Fund to the Universidad Autonoma de San Luis Potosí, UASLP, September 1999–August 2001
- Distinction for academic fulfillment on physics, by School of Science, UASLP, 19 March, 1997

- Distinction as the best student on physics, academic year 95-96, by UASLP, 4 October, 1996
- Distinction for the best average marks on physics, by School of Science, UASLP, 27 March, 1996
- Distinction as the best student on physics, academic year 94-95, by UASLP, 5 October, 1995

## MEETINGS AND CONFERENCES

- *Mexican HAT 2021: Sistemas Hamiltonianos: Aplicaciones y Teoría (Virtual Conference)*, UAM-Azcapotzalco, Mexico, DF, 09–10 December, 2021. Talk presented: *Deformation quantization for the $SL(2,\mathbb{R})$ model for gravity.*
- *MexiLazos 2021 (Virtual Conference)*, UACH, Chihuahua, 11–12 November, 2021. Talk presented: *Deformation quantization of gauge theories (plenary talk).*
- *LIV Congreso Nacional de la Sociedad Matemática Mexicana (Virtual congress)*, BUAP, Puebla, Mexico, 18–22 October, 2021. Talk presented: *Algebraic quantization, deformation, and singular representations in Gauge theories.*
- *XXIX Anual meeting DGFM–SFM (Virtual conference)*, Mexico DF, 07–08 April, 2021.
- *V Meeting on Mathematical modeling in Physics and Geometry*, Mesoamerican Centre for Theoretical Physics, Virtual conference, 27–30 October, 2020. Talk presented: *Covariant momentum map for non-Abelian topological BF field theory.*
- *XIII Workshop DGFM-SMF*, Leon, Mexico, 04–08 November, 2019. Talk presented: *Polysymplectic formulation for BF gravity with Immirzi parameter.*
- *The XXVI$^{\text{th}}$ International Conference on Integrable systems and Quantum Symmetries, ISQS26*, Prague, Czech Republic, 8–12 July, 2019. Talk presented: *The Unruh effect for higher derivative field theory.*
- *International Conference on Mathematical Methods in Physics*, Marrakech, Morocco, 1–5 April, 2019. Invited talk presented: *Polysymplectic structures and General Relativistic models.*
- *Deformation Quantization and its Applications 2019*, Centro Samuel Gitler, Cinvestav, Ciudad de Mexico, Mexico, 01 March, 2019. talk presented: *Perspectives on deformation of a polysimplectic field theory.*
- *III Meeting on Mathematical modeling in Physics and Geometry*, Mesoamerican Centre for Theoretical Physics, Tuxtla Gutierrez, Mexico, 14–16 November, 2018. Talk presented: *Perspectives on the quantization of polysymplectic field theories.*

- *Colima Workshop in Geometry 2018*, UCol, Colima, Mexico, 15–19 October, 2018. Talk presented. *Applications of the De Donder-Weyl formalism for field theories.*

- *Fifth International Conference on Mathematics and its Applications (5CIMA)*, BUAP, Puebla, Mexico, 3–7 September, 2018. Talk presented: *Covariant Poisson structures: Pais-Uhlenbeck model.*

- *Mathematical and conceptual aspects of Quantum theory*, CCM-UNAM-Morelia, Morelia, Mexico, 20–22 June, 2018. Talk presented: *Deformation Quantization for the SL(2,R) model of gravity.*

- *The 27th Workshop on General Relativity and Gravitation in Japan, JGRG27*, Saijo, Japan, 27 November–1 December, 2017. Talk presented: *MacDowell-Mansouri gravity model from a covariant polysymplectic perspective.*

- *MexiLazos 2017*, ICN-UNAM, Mexico, 16–17 November, 2017. Talk presented: *MacDowell-Mansouri gravity model from a covariant polysymplectic perspective.*

- *Fourth International Conference on Mathematics and its Applications (4CIMA)*, BUAP, Puebla, Mexico 4–8 September, 2017. Talk presented: *Multisymplectic structures in field theory.*

- *XI School of the Division "Quantum Gravity: schemes, models and phenomenology", Division of Gravitation and Mathematical Physics of the Mexican Physics Society*, Playa del Carmen, Mexico, 5–9 December, 2016.

- *Third Mexican Workshop in Fractional Calculus*, Zacatecas, Mexico, 11–16 September, 2016.

- *II Summer School on Gravitation and Mathematical Physics*, Unidad Académica de Física, UAZ, Zacatecas, Zac., México, 4–8 July, 2016. Invited course: *Multisymplectic structures in Field theory.*

- *Escola Patricio Letelier de Física-Matemática*, Universidade Federal do Espíritu Santo, Ubu, Brasil, 22–26 February, 2016.

- *XLVIII National Mathematics Congress*, Mexican Mathematical Society, Hermosillo, Son, Mexico, 18–23 October, 2015. Talk presented: *Algebraic structures for Hamilton-Jacobi systems with constraints.*

- *I Workshop on Geometry and Physics (UASLP-USON)*, San Luis Potosi, SLP, Mexico, 14–18 September, 2015.

- *V Workshop on Geometry and Dynamical systems*, San Carlos, Sonora, Mexico, 18–20 March, 2015. Talk presented: *Poisson covariant structures: Finite dimensional systems.*

- *Meeting on Geometry, Fields and Quantization (CCM, UNAM (Morelia)–FC, UASLP)*, UASLP, San Luis Potosi, 11–13 March, 2015. Talk presented: *Aspects of precanonical quantization.*

- *MexiLazos 2014*, BUAP, Puebla, 13–14 November, 2014. Talk presented: *Covariant Poisson structures and cosmological models (plenary talk).*

- *The Quantum Landscape: Generalizations of Quantum Theory and experimental tests*, Perimeter Institute for Theoretical Physics, Waterloo, Canada, 27–31 May, 2013.

- *IV Workshop on Geometry and Dynamical systems*, San Carlos, Sonora, Mexico, 4–8 March, 2013. Talk presented: *Peierls-DeWitt bracket in gauge theories.*

- *MexiLazos 2012*, Centre for Mathematical Sciences, UNAM–Morelia, 9–10 November, 2012.

- *XX Anual meeting DGFM–SFM*, Mexico DF, 15–16 March, 2012. Talk presented: *Cuantización algebraica de modelos cosmológicos (plenary talk).*

- *III Workshop on Geometry and Dynamical systems*, San Carlos, Sonora, Mexico, 8–10 March, 2012. Talk presented: *Group averaging in algebraic quantization.*

- *II Mini-Workshop Symmetries 2010*, Zacatecas, Mexico, 9–11 December, 2010. Talk presented: *Boundary terms in cosmological models and their quantisation.*

- *Crete Conference on Gauge Theories and the Structure of Spacetime*, Kolymvari, Greece, 11–18 September, 2010.

- *Dual CP Institute of High Energy Physics 2010 Workshop: LHC physics and Cosmology*, Colima, Mexico, 4–8 January, 2010.

- *Marcel Grossmann Meeting, MG12*, UNESCO, Paris, France, 12–18 July, 2009. Talk presented: *Ostrogradski approach for the Regge-Teitelboim model.*

- *Dual CP Institute of High Energy Physics 2009 Workshop: Neutrinos, flavor, and extra dimensions*, Puebla, Mexico, 23–25 March, 2009.

- *VII Workshop of the Division of Gravitation and Mathematical Physics of the Mexican Physics Society*, Monterrey, NL, Mexico, 26–30 November, 2007.

- *International Conference on Quantum Gravity LOOPS'07*, Morelia, Mich., Mexico, 25–30 June, 2007.

- *I Workshop in multidimensional spacetime physics*, Morelia, Mich., Mexico, 18–19 May, 2006.

- *Dual CP Institute of High Energy Physics 2006 Workshop: Current trends in EWSB and flavor*, Colima, Mexico, 5–14 January, 2006. Talk presented: *Group averaging and the Quantisation of constrained systems.*

- *VI Workshop of the Division of Gravitation and Mathematical Physics of the Mexican Physics Society*, Metepec, Puebla, Mexico, 20–25 November, 2005. Talk presented: *Superselection sectors in the Ashtekar-Horowitz model.*

- *Fourth British Gravity Meeting, BritGrav IV*, Rutherford Appleton Laboratory, CCLRC, Chilton, Oxfordshire, UK, 15–17 September, 2004.

- *17th International Conference on General Relativity and Gravitation, GR17*, Dublin, Ireland, 18–23 July, 2004. Talk presented: *Group averaging in the* $(p, q)$ *oscillator representation of* $\mathrm{SL}(2, \mathbb{R})$.

- *Third British Gravity Meeting, BritGrav III*, Lancaster University Physics Department, 12–14 September, 2003. Talk presented: *Algebraic quantisation of general relativity.*

- *Second British Gravity Meeting, BritGrav II*, School of Mathematical Sciences, Queen Mary University of London, 10–11 June, 2002.

- *Aspects of Quantum Gravity, from theory to experimental search. 271th. WE-Heraeus-Seminar*, Bad Honnef, Germany, 25 February–3 March, 2002.

- *Latin American School on String Theory, ICTP LASS 2000*, Abdus Salam International Center for Theoretical Physics, Mexico City, 9–27 October, 2000.

- *XLI National Physics Meeting*, Mexican Physics Society, San Luis Potosí, SLP, Mexico, 26–30 October,1998.

- *Propaedeutic Summer School, EPA-1998*, Physics Institute, UASLP, San Luis Potosí, SLP, Mexico, 19 July–20 August, 1998.

- *II Meeting on Differential Geometry*, Mathematics Institute, UNAM Campus Morelia, Morelia, Mich., Mexico, 1–3 April, 1998.

- *XL National Physics Meeting*, Mexican Physics Society, Monterrey, NL, Mexico, 27–31 October, 1997.

- *VI Summer School on Astronomy and Astrophysics*, National Astronomic Observatory (OAN), UNAM Campus Ensenada, Ensenada, BC, Mexico, 8 July–8 August, 1997.

- *II Summer School on Science, UASLP'96*, subject presented: *Measurement of Charge Carriers on Semiconductors*, under the advise of Dr. Francisco J. De Anda, Optical Communication Research Institute (IICO), UASLP, San Luis Potosí, SLP, Mexico, 17 June–19 July, 1996.

## SEMINARS AND COLLOQUIA

- *Gravitational and Geometric Physics Seminar*, Facultad de Física, Universidad Veracruzana, Xalapa, Ver., Mexico, 06 de abril de 2022. Talk presented: *Introducción a la cuantización por deformación para teorías de norma.*
- *Semana de Física, 2021*, Facultad de Ciencias, UASLP, San Luis Potosi, Mexico, 28 October, 2021. Talk presented: *Álgebra geométrica y Física.*
- *Semana de Ciencias, 2021*, Facultad de Ciencias, UASLP, San Luis Potosi, Mexico, 25 March, 2021. Talk presented: *Álgebra, cuantización y Einstein.*
- *Seminario de Física*, Facultad de Física, Universidad Veracruzana, Xalapa, Mexico, 12 March, 2021. Talk presented: *Introduction to geometric formulations for field theories.*
- *LME Seminar*, Facultad de Ciencias, UASLP, San Luis Potosi, Mexico, 03 May, 2019. Talk presented: *Einstein in the XXI Century.*
- *Physics Seminar*, Unidad Académica de Física, UAZ, Zacatecas, Mexico, 27 April, 2018. Talk presented: *Grafeno como medio para comprobar el efecto Unruh gravitacional.*
- *Gravitation and Field Theory Seminar*, ICN-UNAM, CDMX, Mexico, 08 March, 2018. Talk presented: *Fomalismo polisimpléctico y sus aplicaciones en Teoría de campos.*
- *Gravitation Seminar*, DCI-UGto, Leon, Gto., Mexico, 10 October, 2017. Talk presented: *Formalismo de De Donder Weyl para teorías de campo.*
- *Seminar*, Instituto de Investigación en Comunicación Óptica, UASLP, 27 May, 2016. Talk presented: *Quantum gravity: From Optics to a description of Geometry.*
- *Physics Colloquium*, Instituto de Física, UASLP, 11 November, 2015. Talk presented: *Quantum gravity: Algebraic perspectives.*
- *CA Propiedades Ópticas, Electrónicas y Magnéticas de Materiales*, Universidad Autónoma de Zacatecas, Zacatecas, Mexico, 05 February, 2015. Talk presented: *Covariant Poisson structures: From gravitational effects to graphene!*
- *Physics Seminar*, DCI-UGto, Leon, Gto., Mexico, 24 October, 2014. Talk presented: *Covariant Poisson structures and cosmological models.*
- *OSA Student Chapter UASLP*, San Luis Potosi, Mexico, 09 May, 2013. Talk presented: *Different approaches to quantum gravity.*

- *III Joint School UVEG-UASLP: Modern applications of Mathematics*, San Luis Potosi, Mexico, 27 June–8 July, 2011. Course presented: *Differential forms in Riemannian geometry.*

- *Escuela de Primavera 2011*, Unidad Académica de Matemáticas, UAZ, Zacatecas, Mexico, 29 April, 2011. Talk presented: *From Riemann to Einstein.*

- *Unidad Académica de Física*, Universidad Autónoma de Zacatecas, Zacatecas, Mexico, 25 November, 2010. Talk presented: *Álgebras de Clifford y Física.*

- *VII Encuentro Xalapeño de Física*, Universidad Veracruzana, Xalapa, Mexico, 21 May, 2010. Talk presented: *Álgebra y cuantización de la gravitación.*

- *Unidad Académica de Física*, Universidad Autónoma de Zacatecas, Zacatecas, Mexico, 04 March, 2010. Talk presented: *Relatividad general à la ADM.*

- *CA Partículas, Campos y Astrofísica*, Universidad Autónoma de Zacatecas, Zacatecas, Mexico, 17 February, 2010. Talk presented: *Nambu-Dirac formalism for constrained systems.*

- *CA Partículas, Campos y Astrofísica*, Universidad Autónoma de Zacatecas, Zacatecas, Mexico, 25 November, 2009. Talk presented: *Nambu mechanics.*

- *Congreso de Ciencias Exactas, 2009*, Universidad Autónoma de Aguascalientes, Aguascalientes, Mexico, 8 October, 2009. Talk presented: *Algebra and quantum gravity.*

- *CA Partículas, Campos y Astrofísica*, Universidad Autónoma de Zacatecas, Zacatecas, Mexico, 24 March, 2009. Talk presented: *Classical path integrals.*

- *Unidad Académica de Física*, Universidad Autónoma de Zacatecas, Zacatecas, México, 13 November, 2008. Talk presented: *Gravitación cuántica: Una teoría en proceso.*

- *Facultad de Física e Inteligencia Artificial*, Universidad Veracruzana, Xalapa, México, 15 October, 2008. Talk presented: *Cuantización para grupos no–unimodulares.*

- *CA Partículas, Campos y Astrofísica*, Universidad Autónoma de Zacatecas, Zacatecas, Mexico, 7 October, 2008. Talk presented: *Formulación geométrica para la conservación de la energía electromagnética.*

- *CA Partículas, Campos y Astrofísica*, Universidad Autónoma de Zacatecas, Zacatecas, Mexico, 23 September, 2008. Talk presented: *Teorías cuánticas para el modelo de Regge–Teitelboim.*

- *Facultad de Física e Inteligencia Artificial*, Universidad Veracruzana, Xalapa, México, 31 July, 2008. Talk presented: *Cuantización de teorías de norma de alto orden en las derivadas.*

- *CA Partículas, Campos y Astrofísica*, Universidad Autónoma de Zacatecas, Zacatecas, Mexico, 05 June, 2008. Talk presented: *Classical spin in Maxwellian electrodynamics within the framework of Clifford algebras.*

- *CA Partículas, Campos y Astrofísica*, Universidad Autónoma de Zacatecas, Zacatecas, Mexico, 16 April, 2008. Talk presented: *ADM formulation of spacetime theories.*

- *Instituto de Física y Matemáticas*, UMSNH, Morelia, Mich, México, 31 August, 2007. Talk presented: *Cuantización algebraica refinada para sistemas de dimensión finita.*

- *FC-UCOL*, Colima, México, 23 August, 2007. Talk presented: *¿Qué es la gravitación cuántica?*

- *Unidad Académica de Física*, Universidad Autónoma de Zacatecas, Zacatecas, Mexico, 15 March, 2007. Talk presented: *Cuantización de sistemas con constricciones.*

- *Instituto de Física*, Universidad Autónoma de San Luis Potosí, SLP, México, 14 February, 2007. Talk presented: *Cuantización Algebraica Refinada.*

- *Facultad de Física e Inteligencia Artificial*, Universidad Veracruzana, Xalapa, México, 22 November, 2006. Talk presented: *Descomposición ADM de objetos extendidos.*

- *FC-UCOL*, Colima, México, 28 September, 2006. Talk presented: $3 + 1 \neq 4$*: Descomposición ADM del espaciotiempo.*

- *Heisenberg Institute*, Universidad de Colima, Colima, México, 27 May, 2006. Talk presented: *Cosmología y nuestra concepción del universo.*

- *Facultad de Física e Inteligencia Artificial*, Universidad Veracruzana, Xalapa, México, 23 February, 2006. Talk presented: *Cuantización de sistemas con constricciones.*

- *FC-UCOL*, Colima, México, 9 February, 2006. Talk presented: *Cuantización de sistemas con constricciones.*

- *FC-UCOL*, Colima, México, 31 August, 2005. Talk presented: *Álgebras cuánticas de Clifford.*

- *Quantum Gravity Group*, School of Mathematical Sciences, University of Nottingham, UK, 20 July, 2005. Talk presented: *Superselection sectors in the Ashtekar-Horowitz-Boulware model.*

- *Quantum Gravity Group*, School of Mathematical Sciences, University of Nottingham, UK, 27 August, 2003. Talk presented: *Group averaging and a* $\mathrm{SL}(2,\mathbb{R})$ *model of gravity.*

# TEACHING EXPERIENCE

## Graduate level

- *Functional Analysis Methods in Quantum Mechanics.* Facultad de Ciencias, UASLP, 2021-I, 2016-I.

- *General relativity.* Facultad de Ciencias, UASLP, 2019-II, 2018-I and Unidad Académica de Física, UAZ, 2011-I.

- *Mathematical Methods for Theoretical Physics I.* Facutad de Ciencias, UASLP, 2019-I.

- *Quantization of Gauge theories.* Facutad de Ciencias, UASLP, 2018-II.

- *Quantum Field Theory.* Facultad de Ciencias, UASLP, 2015-I.

- *Introduction to the Standard model of Particles.* Unidad Académica de Física, UAZ, 2010-II.

- *Classical mechanics.* Unidad Académica de Física, UAZ, 2011-I and 2009-II.

- *Mathematical methods for physicists.* Unidad Académica de Física, UAZ, 2009-I.

## Undergraduate level

- *Theoretical Physics A: Classical Mechanics.* Facultad de Ciencias, UASLP, 2021-I, 2020-I.

- *Ordinary differential equations.* Facultad de Ciencias, UASLP, 2021-I.

- *Partial differential equations.* Facultad de Ciencias, UASLP, 2020-I 2018-I, 2017-II and 2014-II.

- *Theoretical Physics I.* Facultad de Ciencias, UASLP, 2019-II 2017-II, 2016-II, 2015-II, 2014-II and 2012-II.

- *Resolution of problems I (Algebra).* Facultad de Ciencias, UASLP, 2019-II.

- *Physics II.* Facultad de Ciencias, UASLP, 2019-I 2018-I, 2017-I, 2013-II and 2011-II.
- *Resolution of problems II (Algebra).* Facultad de Ciencias, UASLP, 2018-II.
- *Acoustics.* Facutad de Ciencias, UASLP, 2018-II.
- *Differential calculus.* Facultad de Ciencias, UASLP, 2017-II, 2016-II, 2015-II and 2013-II.
- *Integral calculus.* Facultad de Ciencias, UASLP, 2017-I, 2015-I, 2012-II and 2011-II.
- *Lie Algebras.* Facultad de Ciencias, UASLP, 2016-II.
- *General Relativity.* Facultad de Ciencias, UASLP, 2016-I and 2015-I.
- *Theoretical Physics II.* Facultad de Ciencias, UASLP, 2016-I.
- *Introduction to classical and quantum field theory.* Facultad de Ciencias, UASLP, 2014-I and 2013-I; Unidad Académica de Física, UAZ, 2010-I and 2009-I.
- *Complex variable.* Facultad de Ciencias, UASLP, 2014-I.
- *Matrix algebra.* Facultad de Ciencias, UASLP, 2013-I.
- *Superior calculus.* Facultad de Ciencias, UASLP, 2012-I.
- *Superior algebra.* Facultad de Ciencias, UASLP, 2012-I.
- *Euclidean geometry.* Facultad de Ciencias, UASLP, 2011-II; Unidad Académica de Física, UAZ, 2008-II.
- *Classical mechanics.* Unidad Académica de Física, UAZ, 2010-II; Facultad de Ciencias, UCol, 2006-II and 2005-II.
- *Mathematical methods for physicists.* Unidad Académica de Física, UAZ, 2009-II; Facultad de Ciencias, UCol, 2007-I and 2006-I.
- *Introduction to Cosmology.* Unidad Académica de Física, UAZ, 2008-II.
- *Calculus II.* Unidad Académica de Física, UAZ, 2008-I.
- *Lab I (Mechanics).* Unidad Académica de Física, UAZ, 2008-I.
- *Introduction to Differential Geometry.* Facultad de Ciencias, UCol, 2007-II.
- *Electromagnetism I.* Facultad de Ciencias, UCol, 2007-II.

- *Vector Calculus.* Facultad de Ciencias, UCol, 2005-II.
- *Vector Calculus (problem classes).* School of Mathematical Sciences, University of Nottingham, 2003-I and 2002-I.

# RESEARCH STUDENTS

## Supervision

### Graduate level (MSc)

- Ángel Manuel Rodríguez López, *Geometric covariant Hamiltonian formulation for BF gravity*, Facultad de Ciencias, UASLP (2019).
- Eslava del Río Argüelles, *Multisymplectic formulation for topologically massive Yang-Mills field theory*, Facultad de Ciencias, UASLP (in collaboration with J. Berra-Montiel, 2017).
- David Serrano Blanco, *Moyal product in polymomentum phase-space*, Facultad de Ciencias, UASLP (in collaboration with J. Berra-Montiel, 2017).
- Jairo Javier Martínez Montoya, *Análisis del efecto Unruh por medio de estructuras algebraicas covariantes*, Unidad Académica de Física, UAZ (in collaboration with J. Madrigal-Melchor, 2016).
- César David Palacios García, *Aspectos covariantes de la cuantización por deformación*, Instituto de Física, UASLP (2014).
- Jesús Alberto Acosta López, *Rompimiento de la simetría mediante grupos discretos*, Unidad Académica de Física, UAZ (in collaboration with A. Aranda, 2012).

### Undergraduate level (BSc)

- Josué Guillermo Mateos Trujillo, *Campos de Jacobi para electromagnetismo con ruptura de simetría*, Facultad de Ciencias, UASLP (2019)
- Abiel Felipe Ortíz Martínez, *Formulación Lagrangiana para la ecuación de Schrödinger covariante*, Facultad de Ciencias, UASLP (in collaboration with J. Berra-Montiel, 2018).
- Otoniel Enoc Hernández Agundis, *Cuantización del oscilador de Pais-Uhlenbeck en un espacio no conmutativo*, Facultad de Ciencias, UASLP (in collaboration with J. Berra-Montiel, 2018).
- Sonia Valeria González Torres, *Impacto del programa NRICH dentro del aula: una visión de las matemáticas en escuelas primarias*, Facultad de Ciencias, UASLP (2018).

– Ángel Manuel Rodríguez López, *Función de Wigner para modelos con simetría* $SU(1,1)$, Facultad de Ciencias, UASLP (in collaboration with J. Berra-Montiel, 2017).

– Johann Edir Hernández Ybarra, *Cuantización polimérica para el modelo de Liouville*, Facultad de Ciencias, UASLP (in collaboration with J. Berra-Montiel, 2017).

– Nancy Jazmín Pérez Ortíz, *Aplicaciones del álgebra de Clifford en Electromagnetismo*, Facultad de Ciencias, UASLP (2017).

– Damaris Grageda Acosta, *Transformaciones canónicas para sistemas de dimensión finita*, Facultad de Ciencias, UASLP (2017).

– Ociel Armando Morales García, *Partículas relativistas en potenciales cuánticos*, Facultad de Ciencias, UASLP (in collaboration with J. A. Vallejo, 2015)

– Eslava del Río Argüelles, *Estructuras de Poisson para modelos cosmológicos de Bianchi*, Facultad de Ciencias, UASLP (in collaboration with J. Berra-Montiel, 2015)

– David Serrano Blanco, *Función de Wigner para modelos con simetría* $SL(2,\mathbb{R})$, Facultad de Ciencias, UASLP (in collaboration with J. Berra-Montiel, 2015)

– Jairo Javier Martínez Montoya, *Estructuras de Poisson para sistemas no-autónomos unidimensionales*, Facultad de Ciencias, UASLP (in collaboration with J. Berra-Montiel, 2014)

– César David Palacios García, *Análisis Hamiltoniano para un grupo de Newton-Hooke*, Unidad Académica de Física, UAZ (2013).

– Humberto González Hernández, *Cantidades conservadas para la teoría de Yang-Mills con álgebra geométrica*, Unidad Académica de Física, UAZ (in collaboration with A. Espinoza, 2012).

– Mississippi Valenzuela Durán, *Clasificación algebraíca de los modelos de Bianchi*, Unidad Académica de Física, UAZ (2012).

– Emanuel López Cerda, *El principio de acción estacionaria en el cálculo de variaciones*, Facultad de Ciencias, UASLP (in collaboration with J. A. Vallejo, 2012).

– Jesús Alberto Acosta López, *Minimal group structures for the study of* $G_2$, Unidad Académica de Física, UAZ (2010).

– Adrián Eladio Ramírez Garibo, *Una aproximación geométrica de la acción de Born-Infeld*, Facultad de Ciencias, Universidad de Colima (2010).

### Examining[1]

#### Graduate level

- 2 Participation as External examiner (PhD) (ICN-UNAM 2018, FCFM-BUAP 2012)
- 1 Participation as External examiner (MSc) (ICN-UNAM, 2021)
- 1 Participation as Internal examiner (MSc) (FC-UASLP, 2017)

#### Undergraduate level

- 14 Participations as Internal examiner (Bsc) (5 FC-UASLP, 7 UAF-UAZ, 2 FC-UCol)

## EVENTS ORGANISED

- *Winter Meeting on Geometry and Physics, UASLP*, 2022 (31 March–01 April), 2021 (03–05 March), 2020 (26–28 February), 2019 (23–25 January), FC-UASLP, San Luis Potosi, Mexico.
- *LIX Semana de la Facultad de Ciencias* 22–25 March, 2022, FC-UASLP, San Luis Potosi, Mexico.
- Extended Lectures and courses
  - "Panorama de gravitación cuántica" by Dr José A. Zapata (CCM-UNAM-Morelia), FC–UASLP, San Luis Potosi, Mexico, 03–05 December, 2018.
  - "Fundamentals of Bose-Einstein Condensation (The coldest place in Universe)" by Dr Elías Castellanos Alcántara (MCTP), FC–UASLP, San Luis Potosi, Mexico, 24–26 September, 2018.
  - "A brief introduction to the Standard Model" by Dr Alfredo Aranda (FC-UCol), FC–UASLP, San Luis Potosi, Mexico, 05–07 March, 2018.
  - "A visit to polymeric quantum mechanics" by Dr Ángel Alejandro García Chung (UAM-Iztapalapa), FC–UASLP, San Luis Potosi, Mexico, 31 January–02 February, 2018.
  - "Classical origin of spinfoams" by Dr José Antonio Zapata (CCM-UNAM), FC–UASLP, San Luis Potosi, Mexico, 3–5 November, 2014.
  - "Polymeric representations and Loop Quantum Gravity" by Dr Juan Daniel Reyes (CCM-UNAM), FC–UASLP, San Luis Potosi, Mexico, 18–22 August, 2014.

[1] Excluding students under supervision

  - "Gauge theories and their algebraic quantisation" by Dr Eric Martínez-Pascual (FCFM–BUAP), FC–UASLP, San Luis Potosi, Mexico, 24–28 July, 2013.
  - "General Boundary Formulation of Quantum theory" by Dr Daniele Colosi (CCM–UNAM Campus Morelia), FC–UASLP, San Luis Potosi, Mexico, 29 April–02 May 2013.
  - "An introduction to the standard model of particle physics" by Dr Alfredo Aranda (FC–UCol), UAF–UAZ, Zacatecas, Mexico, 22–25 March, 2011.
  - "Non-commutative physics" by Dr Miguel Sabido (IFUG), UAF–UAZ, Zacatecas, Mexico, 26–28 August, 2009.

- *MexiLazos 2016*, FC–UASLP, San Luis Potosi, Mexico, 9–12 November, 2016.
- *Einstein's General Relativity Centennial*, Series of monthly public lectures, Museo Laberinto de las Ciencias y las Artes, San Luis Potosi, SLP, Mexico, 11 November, 2015–30 June, 2016.
- *Meeting on Geometry, Fields and Quantization (CCM, UNAM (Morelia)–FC, UASLP)*, UASLP, San Luis Potosi, 11–13 March, 2015.
- "Physics and Geometry" Seminar, FC–UASLP, San Luis Potosi, Mexico, 08 February, 2012–Present day (co-organized by J. Berra-Montiel and J. A. Vallejo).
- "FC-UASLP Fortnightly Colloquium", FC–UASLP, San Luis Potosi, Mexico, 05 September, 2012–15 May, 2013 day.
- Second Mini-Workshop "Symmetries 2010", UAF-UAZ, Zacatecas, Mexico, 9–11 December, 2010.
- Joint "Gravitation and Fields" Seminar, UAF–UAZ, Zacatecas, Mexico, 18 May 2010–15 July 2011.
- "Particles, fields and astrophysics" group Seminar UAF–UAZ, Zacatecas, Mexico, 01 April 2008–01 April 2010.

## OUTREACH

- Participant in UASLP Science Summer programme as host researcher: 2021 (15 students, Local online mode, 21 June to 16 July); 2019 (1 student, Local and Regional modes, 3 June to 12 July); 2015 (1 student, National mode, 08 June to 17 July); 2012 (3 students, Local mode, 11 June to 18 July).
- Participant in the Academia Mexicana de Ciencias Summer Research programme as host researcher, XXIX edition: 24 June to 9 August, 2019; XXV edition: 29 June to 21 August, 2015.

- Jury at the *XIX Concurso Nacional de Prototipos 2017*, San Luis Potosi, Mexico, 24-25 May, 2017.
- Jury at the *XVI Concurso Nacional de Prototipos 2014 (Etapa estatal)*, DGETI-SLP, San Luis Potosi, Mexico, 26 February, 2014.
- Participant in the event *Preparar nuestro futuro*, Matehuala, SLP, Mexico, 14 March, 2012.
- *XXII Semana de Investigación y Docencia en Matemáticas*, Hermosillo, Son., Mexico, 5–9 March, 2012. Talk presented: *Group averaging in algebraic quantization.*
- Jury at the *XIV Concurso Nacional de Prototipos 2012 (Etapa estatal)*, DGETI-SLP, San Luis Potosi, Mexico, 07 February, 2012.
- High School talk at *Instituto Potosino*, San Luis Potosi, Mexico, 11 November, 2011.
- High School talk at *Cecyte Plantel 1*, San Luis Potosi, México, 10 November, 2011.
- 1 Newspaper note in local internet based media (CRM), San Luis Potosi, Mexico (2016).
- 4 appearances in show *A ciencia cierta*, Radio Zacatecas, Zacatecas, Mexico.
- 1 appearance in show *Comentarios*, Radio Progreso, Fresnillo, Mexico.
- 1 appearance in show *A tiempo*, Radio Zacatecas, Zacatecas, Mexico.
- 3 Newspaper notes in *La Jornada Zacatecas*, Zacatecas, Mexico.
- 1 Newspaper note in *OEM*, Mexico.