



# Jesús PÉREZ RÍOS, Ph.D.

Department of Physics and Astronomy and  
Institute for Advanced Computational Sciences  
Stony Brook University  
Stony Brook, NY 11794, USA

**“Work hard and pursue your dreams”**

Interview at Journal of Physics B: Atomic, Molecular  
and Optical Physics

[Group webpage](#)

I am an Assistant Professor at the Department of Physics and Astronomy of Stony Brook University, where I conduct my research on theoretical atomic, molecular, and optical (AMO) physics at the borderline of other disciplines of physics and chemistry: physics beyond the Standard Model, condensed matter physics and chemical physics. In addition, I'm affiliated with the Institute for Advanced Computational Sciences at Stony Brook University, where I explore novel techniques to study complex atomic and molecular systems using artificial intelligence.

The research on different topics has led me to develop a remarkable ability to unify different ideas, good skills for associating concepts and methods between various fields, and excellent adaptability. Furthermore, it has given me a broad knowledge of atomic, molecular, and optical physics, a more general view of the science, and many theoretical and computational tools.

## **Skills**

- ✓ Fortran language programming, HTML language programming, LaTeX, Illustrator, Mathematica, and Matlab
- ✓ Molpro quantum chemistry package
- ✓ Gaussian16 quantum chemistry package
- ✓ Scientific libraries, e.g., ARPACK, LAPACK
- ✓ Experience adapting code to High-Performance Computers
- ✓ Spanish (Native)

## **Research Interests**

- ✓ Cold and ultracold chemistry
- ✓ Few-body physics
- ✓ Data science in AMO physics: on the application of machine learning techniques to atomic and molecular systems
- ✓ Physics beyond the Standard Model through AMO systems

## Education

- **2007- 2012 Universidad Complutense de Madrid (Spain)**
- **Ph.D. in Physics (Summa cum laude) 2012**  
Dissertation: “Molecular oxygen collisions: from thermal to the ultracold regime” Academic Advisor: Dr. Marta Isabel Hernández Hernández
- **M.Sc., in Fundamental Physics [Mathematical Physics] 2008**  
Academic Advisor: Dr. Marta Isabel Hernández Hernández
- **B.Sc., in Physics [Fundamental Physics] 2007**

## Awards and Honors

- **Postdoctoral fellow at École Normale Supérieure, Paris (France) 2012-2013**
- **JAE-pre fellowship at CSIC [Spanish National Research Council], Madrid (Spain) 2008-2012**
- **Amazon Web Services collaborative award of \$2500 in HPC credits**

## Stays in internationally recognized centers

**Centre: Kavli Institute for Theoretical Physics, University of California at Santa Barbara (USA)**

- ✓ “Hepfront18 program: High Energy Physics at the Sensitivity Frontier” (2018 -2 weeks)

**Centre: Chemistry Faculty at the University of British Columbia, Vancouver (Canada)**

Supervisor: Roman V. Krems

- ✓ “Collective excitations of  $^2\Sigma$  molecules in a 1-D optical lattice” (2010-3 months)
- ✓ “Ultracold collisions of molecular oxygen in the presence of external magnetic fields” (2009-2 months)

## Research Experience

**Assistant Professor (2022- ): Department of Physics and Astronomy, Stony Brook University, Stony Brook (USA)**

- ✓ Physics beyond the Standard Model
- ✓ Machine learning in AMO systems
- ✓ Cold and ultracold chemistry
- ✓ Few-body processes in chemistry

**Group leader (2019-2021 ): Department of Molecular Physics under the direction of Prof. Dr. Gerard Meijer, Fritz Haber Institute of the Max Planck Society, Berlin (Germany)**

- ✓ Physics beyond the Standard Model
- ✓ Machine learning in AMO systems
- ✓ Cold and ultracold chemistry

**Associate professor (2017-2018): School of Natural Sciences and Technology, Universidad del Turabo, Puerto Rico (USA)**

- ✓ Physics beyond the Standard Model through molecular excitations
- ✓ Decay of Sr ultra-long Rydberg molecules in a highly dense gas
- ✓ Coherent quantum control in ultracold chemical reactions
- ✓ Teaching experience

**Postdoctoral Research (2016): Department of Physics and Astronomy, Purdue University, Indiana (USA) Research advisor: Dr. F. Robicheaux**

- ✓ Study of molecular ion-neutral collisions for sympathetic cooling applications in cold chemistry
- ✓ Quantum chaotic scattering in dipole-dipole interactions
- ✓ Optical cooling schemes for molecular ions.

**Postdoctoral Research (2013-2016): Department of Physics and Astronomy, Purdue University, Indiana ( USA) Research advisor: Dr. Chris H. Greene**

- ✓ Study of Rydberg-neutral interactions at high densities and ultracold temperatures: I-mixing collisions and ultracold chemistry
- ✓ Decay modes of exotic atoms and molecules based on Standard Model physics
- ✓ Development of classical trajectory methods for few-body physics
- ✓ Study of ion-neutral-neutral three-body recombination: cold chemistry
- ✓ Study of transport coefficients in molecular gases in terms of collisional state-to-state rate constants

**Postdoctoral Research (2012-2013): Laboratoire Aimé Cotton, Orsay (France) Research advisor: Dr. Olivier Dulieu**

- ✓ Development of the theoretical framework for atom-molecule photoassociation
- ✓ Study of the long-range interaction between a  $^3\Sigma$  molecule and an atom

**Doctoral Research (2008-2012): Department of Physics of atoms, molecules, and aggregates (FAMA), CSIC [Spanish National Research Council], Madrid (Spain) Research advisor: Dr. Marta Isabel Hernández Hernández**

- ✓ Study of molecular oxygen collisions from thermal to cold regime, in comparison with molecular beam experiments and supersonic jets experiments

- ✓ Ultracold molecular oxygen collisions in the presence of an external magnetic field
- ✓ Nondestructive spectroscopy for molecular ions based on quantum logic schemes
- ✓ Cluster physics, application of the diffusion Monte Carlo method (DMC) technique for finding the ground state energy and the most stable geometry
- ✓ Study of the effects of external fields on the formation of a magnetic Frenkel exciton in a 1-D optical lattice loaded with  $^2\Sigma$  molecules

***Undergraduate Research: Department of Optics, Universidad Complutense de Madrid (Spain)*** Research advisor: Dr. María Luisa Calvo Padilla

- ✓ Application to the dynamic programming method for ray trajectory in inhomogeneous optical media

## **Books**

- **“An Introduction to Cold and Ultracold Chemistry: Atoms, Molecules, Ions and Rydbergs”** J. Pérez-Ríos, Springer (2020)

## **Book chapters**

- **“Dynamic Programming: Application in Optics”** M. L. Calvo, J. Pérez-Ríos and V. Lakshminarayanan, in “Mathematical Optics: Classical, Quantum, and Computational Methods,” Eds. V. Lakshminarayanan, M.L. Calvo and T. Alieva (Taylor & Francis) (2012)
- **“Towards a Molecular Ion Qubit”** J. Mur-Petit, J. Pérez-Ríos, J. Campos-Martínez, M. I. Hernández, S. Willitsch and J.J. García-Ripoll, in “Architecture & Design of Molecule Logic Gates and Atom Circuits”, Vol 2 in the Springer series: “Advances in Atom and Molecule Machines”, Eds. C. Joachim and N. Llorente (2012)
- **“Interactions, bound states and collision dynamics of O<sub>2</sub> + O<sub>2</sub>: and *ab initio* study”** M. I. Hernández M. Bartolomei, E. Carmona-Novillo, J. Pérez-Ríos, J. Campos-Martínez, F. Dayou and R. Hernández-Lamoneda, in “Advanced workshop on theoretical and computational methods for molecular spectroscopy and collisions: application to astrophysical and atmospheric relevant systems”, Eds. C. Muñoz Caro, A. Niño, M. L. Senent and M. Hochlaf, ISBN: 978-84-692-1661-3 (2009)

## **Editorial Work**

- Editor of the Cambridge Elements series in **“Physics Beyond the Standard Model with Atomic and Molecular Systems”**
- Editorial board member of the **Few-body Systems journal**
- Guest editor for a Topical Issue issue in European Journal of Physics D entitled “Atomic, Molecular and Optical techniques for Fundamental Physics”

## Reviewer for the following journals

- Physical Review A / Physical Review Letters / Journal of Physics B / Frontiers in Chemistry / Physical Review X / Journal of Chemical Physics / Journal of Physics Communications / Data Science / Molecular Physics / Physical Chemistry Chemical Physics / Sensors / New Journal of Physics
- IOP trusted reviewer

## Publications

### Top five papers

1. ***“Universal few-body Physics and cluster formation”*** C.H. Greene, P. Giannakeas, and **J. Pérez-Ríos**, Review of Modern Physics 89(035006) (2017) [**173 Citations** in Google Scholar, ]
2. ***“Observation of pendular butterfly Rydberg molecules”*** T. Niederprüm, O. Thomas, T. Eichert, C. Lippe, **J. Pérez-Ríos**, C.H. Greene, and H. Ott, Nat. Commun. 7, 12820 (2016). [**86 citations** in Google Scholar]
3. ***“Probing Ultracold chemical reactions of a single Rydberg atom in a dense gas”*** M. Schlagmüller, T.C. Liebisch, F. Engel, K.S. Kleinbach, F. Böttcher, U.Hermann, K.M. Westphal, A. Gaj, R. Löw, S. Hofferberth, T. Pfau, **J. Pérez-Ríos** and C.H. Greene, Phys. Rev. X 6, 031020 (2016) **Featured in Physics. See Synopsis: Rydberg Atom takes a Dip in the Cold Sea** [**86 citations** in Google Scholar]
4. ***“External field control of collective spin excitations in an optical lattice of  $2\Sigma$  molecules”*** **J. Pérez-Ríos**, F. Herrera, and R.V. Krems, New J. Phys. 12, 103007 (2010) [**84 citations** in Google Scholar]
5. ***“Energy scaling of cold Atom-Atom-Ion three-body recombination”*** A. Krükow, A. Mohammadi, A. Härter, J.H. Denschlag, **J. Pérez-Ríos**, and C.H. Greene, Phys. Rev. Lett. 116, 193201 (2016) [**69 citations** in Google Scholar]

### h-index

h-index = 22 based on Google Scholar.

## Review articles

3. **“Precision spectroscopy of Positronium: Testing bound-state QED and the search for physics beyond the Standard Model”** G. S. Adkins, D.B. Cassidy, and **J. Pérez-Ríos**, Physics Reports, 975, 1 (2022)
2. **“Universal few-body Physics and cluster formation”** C.H. Greene, P. Giannakeas, and **J. Pérez-Ríos**, Review of Modern Physics 89(035006) (2017)
1. **“Controlling Rydberg excitations in dense background gases”** T.C. Liebisch, M. Schlagmüller, H. Nguyen, J. Balewski, G. Lochead, F. Engel, F. Böttcher, K.M. Westphal, K.S. Kleinbach, A. Gaj, R. Löw, S. Hofferberth, T. Pfau, **J. Pérez-Ríos**, and C.H. Greene, J. Phys. B 49, 182001 (2016)

## Scientific articles

67. **“Ion-atom-atom three-body recombination in cold hydrogen and deuterium plasmas”** M.T. Cretu, M. Mirahmadi, and **J. Pérez-Ríos**, Phys. Rev. A 106, 023316 (2022)
66. **“The chemistry of AlF and CaF production in buffer gas sources”** X. Liu, W. Wang, S. Wright, M. Doppelbauer, G. Meijer, S. Truppe, and **J. Pérez-Ríos**, J. Chem. Phys. 157, 074305 (2022)
65. **“Dynamics of a single trapped ion in a high-density medium: A stochastic approach”** M. Londoño, J. Madroñero, and **J. Pérez-Ríos**, Phys. Rev. A 106, 022803 (2022)
64. **“Observation of Chemical Reactions between a Trapped Ion and Ultracold Feshbach Dimers”** H. Hirzler, R.S. Lous, E. Trimby, **J. Pérez-Ríos**, A. Safavi-Naini, and R. Gerritsma, Phys. Rev. Lett. 128, 103401 (2022) Editor’s Suggestion and featured in Physics
63. **“Classical-quantum localization in one dimensional systems: The kicked rotor”** C. Hamilton and, **J. Pérez-Ríos**, AIP Advances, 12, 035040 (2022)
62. **“Spectroscopic characterization of the  $a^3\Pi$  state of aluminum monofluoride”** N. Walter, M. Doppelbauer, S. Marx, J. Seifert, X. Liu, **J. Pérez-Ríos**, B.G. Sartakov, S. Truppe, and G. Meijer, J. Chem. Phys. 156, 103401 (2022)
61. **“Ozone formation in ternary collisions: Theory and experiment reconciled”** M. Mirahmadi, **J. Pérez-Ríos**, O. Egorov, V. Tyuterev, and, V. Kokouline, Phys. Rev. Lett. 128, 108501 (2022)
60. **“Dynamics of translational and rotational thermalization of AlF molecules via collisions with cryogenic helium”** M. Karra, M.T. Cretu, B. Friedrich, S. Truppe, G. Meijer, and **J. Pérez-Ríos**, Phys. Rev A 105, 022808 (2022)
59. **“Electric-field dissociation of weakly bound molecular ions”** **J. Pérez-Ríos**, Phys. Rev. A 104, L031302 (2021)
58. **“Classical threshold law for the formation of van der Waals molecules”** M. Mirahmadi and **J. Pérez-Ríos**, J. Chem. Phys. 155, 094306 (2021)

57. **“Optical cycling of AlF molecules”** S. Höfsäss, M. Doppelbauer, S. Wright, S. Kray, B.G. Sartakov, **J. Pérez-Ríos**, G. Meijer, and S. Truppe, *New Journal of Physics*, 23 075001 (2021)
56. **“Complex Reaction Network Thermodynamic and Kinetic Autoconstruction Based on Ab Initio Statistical Mechanics: A Case Study of O<sub>2</sub> Activation on Ag<sub>4</sub> Clusters”** W. Wang, X. Liu, and **J. Pérez-Ríos**, *J. Phys. Chem. A* 18, 5670 (2021)
55. **“Cold chemistry: a few-body perspective on impurity physics of a single ion in an ultracold bath”** **J. Pérez-Ríos**, *Mol. Phys.* 119, 8 (2021) **Invited article as a new views of Molecular physics**
54. **“Rydberg atom-ion collisions in cold environments”** H. Hirzler and **J. Pérez-Ríos**, *Phys. Rev. A* 103, 0433323 (2021)
53. **“Observation of asymmetric line shapes in precision microwave spectroscopy of the positronium  $2\ 3\ S\ 1 \rightarrow 2\ 3\ P\ J\ (J = 1, 2)$  fine-structure intervals”** L. Gurung, R.J. Bajib, **J. Pérez-Ríos**, S.D. Hogan and D.B. Cassidy, *Phys. Rev. A* 103, 042805 (2021)
52. **“Life and death of a cold BaRb<sup>+</sup> molecule inside an ultracold cloud of Rb atoms”** A. Mohammadi, A. Krüchow, A. Mahdian, M. Deiss, **J. Pérez-Ríos**, H. da Silva Jr., M. Raoult, O. Dulieu and J.H. Denschlag, *Phys. Rev. Research* 3, 013196 (2021)
51. **“On the relationship between spectroscopic constants of diatomic molecules: a machine learning approach”** X. Liu, G. Meijer, and **J. Pérez-Ríos**, *RSC Advances* 11, 14552 (2021)
50. **“Characterisation of the  $b\ 3\Sigma^+$ ,  $v = 0$  state and its interaction with the  $A\ 1\Pi$  state in aluminium monofluoride”** M. Doppelbauer, N. Walter, S. Hofsäss, S. Kray, **J. Pérez-Ríos**, B.G. Sartakov, S. Truppe, and G. Meijer, *Mol. Phys.* 119, e1810351 (2021)
49. **“Predicting second virial coefficients of organic and inorganic compounds using Gaussian Process Regression”** X. Liu, G. Meijer, and **J. Pérez-Ríos**, *Phys. Chem. Chem. Phys.* 23, 2891 (2021)
48. **“On the formation of van der Waals complexes through three-body recombination”** M. Mirahmadi and **J. Pérez-Ríos**, *J. Chem. Phys.* 154, 034305 (2021)
47. **“A data-driven approach to determine dipole moments of diatomic molecules”** X. Liu, G. Meijer, and **J. Pérez-Ríos**, *Phys. Chem. Chem. Phys.* 22, 24191 (2020)
46. **“Controlling the nature of a charged impurity in a bath of Feshbach dimers”** H. Hirzler, E. Trimby, R.S. Lous, G. C. Groenenboom, R. Gerritsma, and **J Pérez-Ríos**, *Physical Review Research* 2, 033232 (2020)
45. **“The diatomic molecular spectroscopy database”** X. Liu, S. Truppe, G. Meijer, and **J. Pérez-Ríos**, *J. Cheminform* 12, 31 (2020)
44. **“C<sub>6</sub> coefficients for interacting Rydberg atoms and alkali-metal dimers”** V. Olaya, **J. Pérez-Ríos**, and F. Herrera, *Physical Review A* 101, 032705 (2020)
43. **“Spectroscopic characterization of aluminum monofluoride with relevance to laser cooling and trapping”** S. Truppe, S. Marx, S. Kray, M. Doppelbauer, S. Hofsäss, H.C. Schewe, N. Walter, **J. Pérez-Ríos**, B.G. Sartakov, and G. Meijer, *Phys. Rev. A* 100, 052513 (2019)



42. ***“Direct detection of nuclear scattering of sub-GeV dark matter using molecular excitations”*** R. Essig, J. Pérez-Ríos, H. Ramani, and O. Slone, Physical Review Research 1 (3), 033105 (2019)
41. ***“Current and future perspectives of positronium and muonium spectroscopy as dark sectors probe”*** C. Frugiuele, J. Pérez-Ríos, and C. Peset, Physical Review D 100 (1), 015010 (2019)
40. ***“Genetic based fitting techniques for high precision potential energy curves of diatomic molecules”*** I.C. Stevenson and J. Pérez-Ríos, Journal of Physics B: Atomic, Molecular and Optical Physics 52 (10), 105002 (2019)
39. ***“Vibrational quenching and reactive processes of weakly bound molecular ions colliding with atoms at cold temperatures”*** J. Pérez-Ríos, Physical Review A 99 (2), 022707 (2019)
38. ***“Universal temperature dependence of the ion-neutral-neutral three-body recombination rate”*** J. Pérez-Ríos, C.H. Greene, Atomic Physics Phys. Rev. A 98, 062707 (2018)
37. ***“Observation of Quantum Interference and Coherent Control in a Photochemical Reaction”*** D.B. Blasing, J. Pérez-Ríos, Y. Yan, S. Dutta, C.-H Li, Q. Zhou, and Y.P. Chen, Phys. Rev. Lett. 121, 073202 (2018)
36. ***“Searching for light dark matter through Positronium decay”*** J. Pérez-Ríos and S.T. Love, The European Physical Journal D 72 (3), 44 (2018)
35. ***“Ultracold molecule assembly with photonic crystals”*** J. Pérez-Ríos, M.E. Kim, and C.L. Hung, New Journal of Physics 19 (12), 123035(2017)
34. ***“Lifetimes of ultralong-range strontium Rydberg molecules in a dense Bose Einstein condensate”*** J.D. Whalen, F. Camargo, R. Ding, T.C. Killian, F.B. Dunning, J. Pérez-Ríos, S. Yoshida, and J. Burgdörfer, Physical Review A 96 (4), 042702 (2017)
33. ***“Anisotropic blockade using pendular Rydberg butterfly molecules”*** M.T. Eiles, H. Lee, J. Pérez-Ríos, and C.H. Greene, Phys. Rev. A 95, 052708 (2017)
32. ***“Two-photon photoassociation spectroscopy of an ultracold heteronuclear molecule”*** S. Dutta, J. Pérez-Ríos, D. Elliott, and Y.P. Chen, Phys. Rev. A 95, 013405 (2017)
31. ***“Scattering Fractals and Quantum Chaos in Ultracold Dipolar Collisions”*** B.C. Yan, J. Pérez-Ríos, and F. Robicheaux, Phys. Rev. Lett. 118, 154101 (2017)
30. ***“Rotational state-selective attachment of He atoms to cold, molecular ions: an action spectroscopic scheme for rotational spectroscopy”*** S. Brünken, L. Kluge, A. Stoffels, J. Pérez-Ríos, and S. Schlemmer, Journal of Molecular Spectroscopy, Volume 332, p. 67-78. (2017)
29. ***“Short-range photoassociation of LiRb”*** D.B. Blasing, I. Stevenson, J. Pérez-Ríos, D.S. Elliott, and Y.P. Chen, Phys. Rev. A 94, 062504 (2016)
28. ***“Rotational relaxation of molecular ions in a buffer gas”*** J. Pérez-Ríos and F. Robicheaux, Phys. Rev. A 94, 032709 (2016)



27. **“Effective atom-molecule conversions using radio frequency fields”** Y. Ding, **J. Pérez-Ríos** and C.H. Greene, ChemPhysChem 17, 3756 (2016)
26. **“Probing Ultracold chemical reactions of a single Rydberg atom in a dense gas”** M. Schlagmüller, T.C. Liebisch, F. Engel, K.S. Kleinbach, F. Böttcher, U.Hermann, K.M. Westphal, A. Gaj, R. Löw, S. Hofferberth, T. Pfau, **J. Pérez-Ríos** and C.H. Greene, Phys. Rev. X 6, 031020 (2016) **Featured in Physics. See Synopsis: Rydberg Atom takes a Dip in the Cold Sea**
25. **“Observation of pendular butterfly Rydberg molecules”** T. Niederprüm, O. Thomas, T. Eichert, C. Lippe, **J. Pérez-Ríos**, C.H. Greene, and H. Ott, Nat. Commun. 7, 12820 (2016).
24. **“Mapping trilobite state signatures in atomic hydrogen”** **J. Pérez-Ríos**, M.T. Eiles, and C.H. Greene, J. Phys. B 49, 14LT01 (2016) **Selected as a highlight paper in Journal of Physics B in 2016**
23. **“Ultracold molecular Rydberg physics in a high density environment”** M.T. Eiles, **J. Pérez-Ríos**, F. Robicheaux, and C.H. Greene, J. Phys. B 49, 114005 (2016) **Selected as a highlight paper in Journal of Physics B in 2016**
22. **“Probing a scattering resonance in Rydberg molecules with a Bose-Einstein condensate”** M. Schlagmüller, T.C. Liebisch, H. Nguyen, G. Lochead, F. Engel, F. Böttcher, K.M. Westphal, K.S. Kleinbach, R. Löw, S. Hofferberth, T. Pfau, **J. Pérez-Ríos** and C.H. Greene, Phys. Rev. Lett. 116, 053001 (2016)
21. **“Energy scaling of cold Atom-Atom-Ion three-body recombination”** A. Krüchow, A. Mohammadi, A. Härter, J.H. Denschlag, **J. Pérez-Ríos**, and C.H. Greene, Phys. Rev. Lett. 116, 193201 (2016)
20. **“Effective single photon decay mode of Positronium via electroweak interactions”** **J. Pérez-Ríos** and S.T. Love, J. Phys. B 48, 244009 (2015). **Selected as a LabTalk in Journal of Physics B**
19. **“Communication: Classical threshold law for ion-neutral-neutral three-body recombination”** **J. Pérez-Ríos**, and C.H. Greene, J. Chem. Phys. 143, 041105 (2015)
18. **“Theory of long-range ultracold atom-molecule photoassociation”** **J. Pérez-Ríos**, M. Lepers, and O. Dulieu, Phys. Rev. Lett. 115, 073201 (2015)
17. **“Quantum Defect Theory description of weakly bound levels and Feshbach resonances in LiRb”** **J. Pérez-Ríos**, S. Dutta, and C.H. Greene, New J. Phys. 17, 045021 (2015)
16. **“Two-photon total annihilation of molecular positronium”** **J. Pérez-Ríos**, S.T. Love, and C.H. Greene, Eur. Phys. Lett. 109, 63002 (2015)
15. **“Formation of ultracold  $7\text{Li}85\text{Rb}$  molecules in the lowest triplet electron state by photoassociation and their detection by ionization spectroscopy”** A. Altaf, S. Dutta, J. Lorenz, **J. Pérez-Ríos**, Y.P. Chen, and D.S. Elliott, J. Chem. Phys. 142, 114310 (2015)
14. **“Rotational relaxation in molecular hydrogen and deuterium: Theory versus acoustic experiments”** S. Montero, and **J. Pérez-Ríos**, J. Chem. Phys. 141, 114301 (2014)

13. ***"Can density functional theory methods be used to simulate the  $\epsilon$  phase of solid oxygen?"*** M. Bartolomei, J. Pérez-Ríos, E. Carmona-Novillo, M. I. Hernández, J. Campos-Martínez, and R. Hernández-Lamonedá, Chem. Phys. Lett. 592, 170 (2014)
12. ***"Comparison of classical and quantal calculations of helium three-body recombination"*** J. Pérez-Ríos, S. Ragole, J. Wang, and C.H. Greene, J. Chem. Phys. 140, 044307 (2014)
11. ***"How does a magnetic trap work?"*** J. Pérez-Ríos and A. Sanz. Am. J. Phys. 81, 836 (2013)
10. ***"Temperature-independent quantum logic for molecular spectroscopy"*** J. Mur-Petit, J. J. García-Ripoll, J. Pérez-Ríos, J. Campos-Martínez, M.I. Hernández, and S. Willitsch, Phys. Rev. A 85, 022308 (2012)
9. ***"Role of the anisotropy at high energy diatomic-diatom molecule scattering"*** J. Pérez-Ríos, M. Bartolomei, J. Campos-Martínez, and M.I. Hernández, Chem. Phys. Lett. 522, 28 (2012)
8. ***"Properties of the molecular oxygen trimer from pairwise additive interactions"*** R. Hernández-Lamonedá, J. Pérez-Ríos, E. Carmona-Novillo, M. Bartolomei, J. Campos-Martínez, and M.I. Hernández, Chem. Phys. 399, 80 (2012)
7. ***"The molecular oxygen tetramer: Intermolecular interactions and implications for the  $\epsilon$  solid phase"*** M. Bartolomei, E. Carmona-Novillo, M.I. Hernández, J. Pérez-Ríos, J. Campos-Martínez, and R. Hernández-Lamonedá, Phys. Rev. B 84, 092105 (2011)
6. ***"Inelastic collisions in molecular oxygen at low temperature ( $4 \leq T \leq 34$  K). Close-coupling calculations versus experiment"*** J. Pérez-Ríos, G. Tejada, J. M. Fernández, M.I. Hernández, and S. Montero, J. Chem. Phys. 134, 174307 (2011)
5. ***"Ultracold O<sub>2</sub>-O<sub>2</sub> collisions in a magnetic field: on the role of the potential energy surface"*** J. Pérez-Ríos, J. Campos-Martínez, and M.I. Hernández J. Chem. Phys. 134, 124310 (2011)
4. ***"Diatom-Diatom Interactions: Building Potential Energy Surface and Effect of Intramolecular Vibrations"*** E. Carmona-Novillo, M. Bartolomei, J. Pérez-Ríos, J. Campos-Martínez, and M.I. Hernández, Int. J. Quant. Chem. 111, 333 (2010)
3. ***"External field control of collective spin excitations in an optical lattice of  $2\Sigma$  molecules"*** J. Pérez-Ríos, F. Herrera, and R.V. Krems, New J. Phys. 12, 103007 (2010)
2. ***"Dynamic programming revisited: a generalized formalism for arbitrary ray trajectories in inhomogeneous optical media with radial dependence"*** M.L. Calvo and J. Pérez-Ríos, J. Opt. A, 11, 125403 (2009)
1. ***"Quantum-Mechanical Study of the Collision Dynamics of O<sub>2</sub>( $3\Sigma_g^-$ ) + O<sub>2</sub>( $3\Sigma_g^-$ ) on a New *ab Initio* Potential Energy Surface"*** J. Pérez-Ríos, M. Bartolomei, J. Campos-Martínez, M.I. Hernández, and R. Hernández-Lamonedá, J. Phys. Chem. A, 113, 14952 (2009)

## Conference Proceedings

5. **“Lifetimes of ultralong-range strontium Rydberg molecules in cold dense gases”** J.D. Whalen, F. Camargo, R. Ding, T.C. Killian, F.B. Dunning, **J. Pérez-Ríos**, S. Yoshida, and J. Burgdörfer *Journal of Physics: Conference Series* 875 (2), 012013 (2017)
4. **“Ultracold molecules strongly coupled to a nanophotonic crystal: an universal platform for ultracold chemistry experiments”** **J. Pérez-Ríos**, M. Kim, and C.L. Hung *Journal of Physics: Conference Series* 875 (9), 082006 (2017)
3. **“Lifetimes of ultralong-range Strontium Rydberg molecules in a dense BEC”** F. Camargo, J.D. Whalen, R. Ding, T.C. Killian, F.B. Dunning, **J. Pérez-Ríos**, S. Yoshida, and J. Burgdörfer *Journal of Physics: Conference Series* 875(9), 082001 (2017)
2. **“Reactivity in ion-neutral high density media”** **J. Pérez-Ríos** and C.H. Greene, *EPJ Web of Conferences* 113, 02004 (2016)
1. **“Progress towards ultracold chemistry: ultracold atomic and photonics collisions”** **J. Pérez-Ríos**, M. Lepers, R. Vixeu, N. Bouloufa-Maafa, and O. Dulieu, *Journal of Physics: Conference Series* 488, 012031 (2014)

## Conference Participation (only talks)

- 2022 **DAMOP (Ion-atom-atom three-body recombination in cold hydrogen and deuterium plasmas)**
- 2021 **Workshop on Cold Rydberg** (online): “Cold Rydberg-ion collisions”
- 2021 **ICTS Trapped Atoms, Molecules and Ions Meeting** (online): “Few-body processes in cold chemistry”
- 2018 **Few-Body and Collective Many-body Behavior with Charge Impurities in Atomic Quantum Gases** (San Feliu de Guíxols Spain): “Vibrational quenching and reactive processes of weakly bound molecular ion-atom collisions and cold temperatures”
- 2018 **New Probes of Physics beyond the Standard Model** (KITP, USA): “Detecting Dark Matter-Nucleus Scattering through Molecular Excitations”
- 2017 **XIX International Workshop on Low-Energy Positron and Positronium Physics & XX International Symposium on Electron-Molecule Collisions and Swarms** (Queensland, Australia) “The role of neutrinos in atomic physics: exotic decay channels in positronium, and the two-photon decay channel in dipositronium”
- 2017 **ITAMP Physics, Harvard-Smithsonian Center for Astrophysics**, Cambridge, Massachusetts “A single Rydberg atom in a high density media: a chemistry-assisted new world”
- 2016 **DAMOP (Probing a scattering resonance with Rydberg molecules inside a Bose-Einstein condensate)**

- 2016 **QSCP-XXI** (*Implusive Interatomic Coulombic decay in the simplest molecular anion*)
- 2015 **21st International Conference on Few-body problems in physics**
- 2015 **DAMOP** (*Cold chemistry in high density atom-ion environments*)
- 2014 **APS, March Meeting** (*Three-body recombination of helium atoms from ultracold to thermal energies: classical trajectory vs. quantal calculations*)
- 2014 **MCAM**, *Mid-West conference on ultracold molecules and atoms*
- 2011 **IMMAPC International Meeting on Atomic and Molecular Physics and Chemistry**
- 2011 **MWOQS**, *Madrid Workshop on Open Quantum Systems*
- 2010 **MOLEC XVIII European Conference on Dynamics of Molecular Systems**
- 2006 **ICO topical Meeting**, St.Petersburg on Optoinformatics/Information Photonics

### **Invited Colloquia**

- 2020 Max-Planck-Institut für Plasmaphysik (Germany) ***“Molecules as dark matter detectors”***
- 2019 Department of physics, Clemson University (USA) ***“Cold chemistry from chemical reactions to quantum logic spectroscopy”***
- 2017 Institute for Molecules and Materials, Radboud University (The Netherlands) ***“Cold chemistry: on the role of internal degrees of freedom”***

### **Seminars**

- 2022 Loomis Laboratory of Physics, University of Illinois and Urbana-Champaign (USA) ***“Few-body physics in ion-neutral hybrid systems”***
- 2021 Institute for Molecules and Materials, Radboud University (Online) ***“Few-body processes in atom-ion hybrid systems”***
- 2020 Department of Physics, University of Freiburg (Online) ***“A few-body perspective to impurity physics: cold chemistry”***
- 2019 Faculty of Science, University of Amsterdam (The Netherlands) ***“Relaxation mechanisms of molecular ions in the presence of an atomic gas”***

- 2018 Department of Chemistry of University of Santiago de Compostela (Spain) ***“Genetic based fitting techniques for potential energy curves of diatomic molecules”***
- 2018 High Energy Physics Institute (IFAE) (Spain) ***“Direct detection of dark matter through molecular excitations”***
- 2018 Dalitz seminar of particle physics at Oxford University (UK) ***“Direct detection of dark matter through molecular excitations”***
- 2017 Universidad Complutense de Madrid (Spain) ***“Ultracold Rydberg atoms in high density media: chemistry and many-body physics”***
- 2017 ETH (Switzerland) ***“Relaxation phenomena in cold molecular ions ”***
- 2017 Stuttgart Universität (Germany) ***“Anisotropic many-body interaction with ultracold Rydberg molecules”***
- 2017 Ulm Universität (Germany) ***“Rotational relaxation processes of molecular ions immersed in a buffer gas and optical trapping of molecular ions”***
- 2016 ICFO The Institute of Photonic Sciences, Barcelona (Spain) ***“Rydberg Atoms in High Density Media: The Ultracold Chemistry behind the Scenes”***
- 2010 Institute for Fundamental Physics at the Spanish National Research Council ***“Ultracold molecular collisions”***