

DR. JUAN DIEGO JARAMILLO SALAZAR

Curriculum Vitae



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Links [ResearcherID](#), [ResearchGate](#)

Place of Birth *Colombia*

Date of Birth 28 March 1983

Nationality Colombian

"The good life is one inspired by love and guided by knowledge."

BERTRAND RUSSELL

POSITIONS

<i>Lecturer</i>	2019-2020	Universidad del Valle Universidad del Valle Sede Tuluá Villa Campestre, Calle 43 No. 43-33, Tuluá, Colombia
<i>Postdoc</i>	2018-2019	Universität Augsburg Institut für Physik Universitätsstr. 1 D-86159 Augsburg Advisor: Prof. Dr. Dr. h.c. Peter Hänggi
<i>Postdoc</i>	2016-2017	National University of Singapore Department of Physics 2 Science Drive 3 S-117551 Singapore Advisor: Dr. Jiangbin Gong

2015 University of Massachusetts Boston
 Postdoc Department of Physics
 100 Morrissey Blvd.
 Boston MA 02125-3393 USA
 Advisor: Dr. Adolfo del Campo

EDUCATION

2010-2014 Leibniz Universität Hannover
 PhD Institute for Theoretical Physics

Appelstrasse 2, 30167 Hannover, Germany
Thesis: *One Dimensional 4-Component Alkali Fermions*
Description: Experiments in ultracold atoms suggest that an effective 4-components spinor gas is responsible for the spin dynamics of ^{40}K . In this thesis we determine the corresponding phase diagram using a combination of numerical and analytical tools. In particular, we make an extensive use of bosonization to characterize the low energy excitations around the phase transitions.
Advisor: Dr. Jun.-Prof. Temo Vekua

2008-2009 Abdus Salam Intl. Centre for Theo. Physics
 Diploma Condensed Matter Physics Section

Str. Costiera, 11, Trieste, Italy
Thesis: *Topological Order in Matter*
Description: Review on the physics of anyons, particles carrying representations of the braiding group; including application to topological qubits and their relation to quantum groups.
Advisor: Dr. Prof. Giuseppe Mussardo

2001-2007 Universidad del Valle - Colombia
 Bachelor of Science Department of Physics

Calle 13 # 100-00, Cali, Valle del Cauca, Colombia
Thesis: *Local and Global Quantum Computation: Evaluation of Interaction Cost in Nano-structures*
Description: In this thesis we compare the polynomial efficiency between different architectures for quantum computation based on cellular automata, as a measure of time in the performance of a universal set of quantum logic gates.
Advisor: Dr. John H. Reina

PUBLICATIONS

May 2018 Generation and stabilization of Bell states
 via repeated projective measurements on a
 driven ancilla qubit

Physica Scripta **Phys. Scr.** **93**, 064001. We propose a non-deterministic protocol to generate Bell States via repeated projective measurements on a driven ancilla qubit. In contrast to similar approaches, it is not based on a parity meter.
 Authors: Luca MAGAZZÙ, Juan D. JAMARILLO, Peter TALKNER, and Peter HÄNGGI

Oct 2017 Quantum work fluctuations in connection
 with the Jarzynski Equality

Physical Review E **Phys. Rev. E** **96**, 042119. The Jarzynski equality (JE) is a well established non-equilibrium method to estimate free energy differences. We report on the existence of divergences in the variance of the Jarzynski equality as induced by non-adiabaticity in the classical and quantum domain.
 Authors: Juan D. JARAMILLO, Jiawen DENG, and Jiangbin GONG

- Entropy* Jul 2017 Deformed Jarzynski Equality
Entropy, **19**(8), 419. We present a deformed Jarzynski equality for both classical and quantum non-equilibrium statistics, in efforts to reuse experimental data that already suffers from severe statistical error. The technique proves useful for classical systems and provides insight into the distinctive statistical error from quantum effects.
 Authors: Jiawen DENG, Juan D. JARAMILLO, Peter HÄNGGI, and Jiangbin GONG
- New J. Phys.* Jul 2016 Quantum supremacy of Many-Particle Thermal Machines
New J. Phys., **18**, 075019. We show how the interplay of nonadiabatic and many-particle quantum effects leads to quantum thermal machines that outperform an ensemble of single-particle heat engines with same resources.
 Authors: Juan D. JARAMILLO, Mathieu BEAU, and Adolfo DEL CAMPO
- Entropy* Mar 2016 Scaling-Up Quantum Heat Engines Efficiently via Shortcuts to Adiabaticity
Entropy, **18**(5), 168. We scale up a quantum heat engine with a many-particle working medium using shortcuts to adiabaticity to boost power with minimal quantum friction. The particles interact via inverse-square pairwise potential and are confined by a time-dependent harmonic trap. We report performance for the Otto cycle.
 Authors: Mathieu BEAU, Juan D. JARAMILLO, and Adolfo DEL CAMPO
- Physical Review A* Oct 2013 Band-to-Mott Insulator Transformations in 4-component Alkali-metal Fermions at Half-filling
Phys. Rev. A **88**, 043616. We study the influence of an external magnetic field in a fermi gas with spin-changing collisions.
 Authors: Juan D. JARAMILLO, Sebastian GRESCHNER, and Temo VEKUA
- Physical Review B* Oct 2013 Spin-orbit Coupled Fermions in Ladderlike Optical Lattices at Half-filling
Phys. Rev. B **88**, 165101. We study the ground-state phase diagram of two-component fermions loaded in a ladderlike lattice at half filling in the presence of spin-orbit coupling.
 Authors: Gao-Yong SUN, Juan D. JARAMILLO, Luis SANTOS, and Temo VEKUA
- Brazilian Journal of Physics* Dec 2008 Temporal Resources for Global Quantum Computing Architectures
Braz. J. Phys. **38**, Numb. 4. Using the methods for optimal simulation of quantum logic gates, we perform a quantitative estimation of the time resources involved in the execution of universal gate sets for the case of three representative models of quantum computation based on global control.
 Authors: Juan D. JARAMILLO, and John H. REINA

PRESENTATION AT INTERNATIONAL WORKSHOPS AND CONFERENCES

2016 · Talk at C3QS Conference: Coherent Control of Complex Quantum Systems, Okinawa Institute of Technology, Okinawa, Japan. Title: “Quantum supremacy of many-particle thermal machines”

2015 · Invited colloquium talk at University of Massachusetts Boston. Department of Physics. Title: “Strongly Correlated Spinor Gas”

2014 · Invited colloquium talk at Universidad Nacional de Colombia, Sede Manizales. Department of Physical Engineering. Location: Manizales, Caldas, Colombia. Title: "Fermiones Alcalinos en 1D: El diagrama de fases de ^{40}K "

2013 · RTG Workshop 2013. Research Training Group 1729: Fundamentals and applications of ultra-cold matter, Leibniz Universität Hannover. Location: Goslar, Lower Saxony, Germany.

Talk: "*Spin-3/2 Fermions with Cold Gases*"

2012 · 6th Windsor Summer School: Low-Dimensional Materials, Strong Correlations and Quantum Technologies.

Poster Contribution: "*Quartetting to Pairing Transition in Spin-3/2 Fermions Under the Quadratic Zeeman Coupling*"

2011 · École de Physique des Houches: Strongly Correlated Electronic Systems, Beyond Fermi Liquid Theory. Location: Chamonix, France.

Poster Contribution: "*Induced Transitions in Spin-3/2 Condensates*"

2010 · Quo Vadis Bose-Einstein Condensation? International Workshop and Summer School. Max-Planck-Institut für Physik komplexer Systeme.

2007 · Geometric and Topological Methods for Quantum Field Theory, Summer School, Villa de Leyva, Colombia.

2005 · 2nd National Meeting of Quantum Computing and Quantum Information, Popayán, Colombia.

COMPUTER SKILLS

<i>Basic</i>	JAVA, FORTRAN, MATLAB
<i>Intermediate</i>	HTML, CSS, PHP, C/C++, BASH (Unix Shell)
<i>Advanced</i>	PYTHON, WOLFRAM MATHEMATICA, L ^A T _E X

PROFESSIONAL EXPERIENCE

<i>Referee</i>	<i>Scientific Reports</i> , Nature Publishing Group New Journal of Physics, IOP Publishing
<i>Education</i>	Teaching assistant at Leibniz Universität Hannover Teaching assistant at Augsburg Universität

PROFESSIONAL INTERESTS

<i>General</i>	Quantum Technology, Quantum Dynamics, Condensed Matter Physics
<i>Specific</i>	Quantum Heat Engines, Fluctuation Theorems, Quantum Many-Body Physics

OTHER INFORMATION

<i>Languages</i>	SPANISH · Mothertongue
	ENGLISH · Fluent
	GERMAN · Basic

ACADEMIC REFEREES

- Postdoc Advisor* Prof. Dr. Dr. h.c. Peter Hänggi
 Professor of Physics
 Institut für Physik
 Universität Augsburg
 Universitätsstr. 1
 D-86159 Augsburg
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- Postdoc Advisor* Dr. Jiangbin Gong
 Professor of Physics
 Faculty of Science
 National University of Singapore
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 2 Science Drive 3
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- Postdoc Advisor* Dr. Adolfo del Campo
 Associate Professor of Physics
 College of Science and Mathematics
 University of Massachusetts Boston
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 Email: adolfo.delcampo(at)umb.edu
- PhD Advisor* Dr. Jun.-Prof. Temo Vekua
 Junior Professor
 Condensed Matter
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 Institut für Theoretische Physik
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 Office Location: Raum 210
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 Email: Temo.Vekua(at)itp.uni-hannover.de
- Diploma Advisor* Dr. Prof. Giuseppe Mussardo
 Full Professor
 Statistical Physics
 Scuola Internazionale Superiore di Studi Avanzati (SISSA)
 via Bonomea, 265 - 34136 Trieste, Italy
 Phone: +39 040 3787 411
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- BSc Advisor* Dr. John H. Reina
 Associate Professor
 Quantum Technology, Information and Complexity
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 Calle 13 No 100-00 Cali, Colombia
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