

Lucas Chibebe Céleri *July 05th, 1976*

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Summary

I studied physics at the State University of São Paulo (Rio Claro, SP, Brazil), finishing my undergraduate degree receiving the award for the class best academic performance. After this, I moved to the city of São Carlos (SP, Brazil) where I received my MSc degree from the Institute of Physics of São Carlos, University of São Paulo. My dissertation dealt with non-symmetric extensions of the general theory of relativity and quantum field theory in curved space-times. I received my PhD in 2008 in the same city, from the Department of Physics at Federal University of São Carlos. My thesis was developed in the field of open quantum systems and the dynamical Casimir effect. After that, I moved to the

Centre for Natural and Human Sciences at Federal University of ABC, in the city of Santo André (SP, Brazil), as a postdoctoral researcher. I spent four years studying quantum information theory, specially its links with the foundations of quantum mechanics, relativity and thermodynamics both theoretically and experimentally. Since the end of 2012, I hold a permanent position at the Institute of Physics at Federal University of Goiás, in the city of Goiânia (GO, Brazil), leading the Quantum Pequi Group (www.qpequi.com). My main duties are teaching (undergraduate and graduate), supervising students and to pursue research. My main research interests are the foundations of quantum mechanics, relativity and thermodynamics, as seen through the lenses of information theory.

Employment

Federal University of Goiás

GOIÂNIA, BRAZIL

Professor

Since Nov 2012

My attributions in the University include teaching physics at both under-graduation and graduation levels, performing research in physics and also supervising students. I am the head of the Quantum Pequi research group (QPequi)

Federal University of ABC

SANTO ANDRÉ, BRAZIL

Postdoctoral fellow

Aug 2008 – Oct 2012

As part of the Quantum Information Group (QIG) at the University, my attribution was mainly to pursue research, both theoretical and experimental

Administrative positions

Federal University of Goiás

GOIÂNIA, BRAZIL

Coordinator of the Physics Graduation Program

Since March 2021

Some universities I visited

University of Basque Country

BILBAO, SPAIN

June, 2023

Universidad de Concepción

CONCEPCIÓN, CHILE

May, 2023

University of Basque Country

BILBAO, SPAIN

November, 2021 — January, 2022

University of Basque Country

BILBAO, SPAIN

July, 2019 — September, 2020

Oak Ridge National Laboratory	OAK RIDGE, USA October — October, 2019
International Institute of Physics	NATAL, BRAZIL January — March, 2019
University of Basque Country	BILBAO, SPAIN September — December, 2018
Federal University of Santa Catarina	FLORIANÓPOLIS, BRAZIL August — September, 2018
Universidad de Concepción	CONCEPCIÓN, CHILE July, 2018
University of Warsaw	WARSAW, POLAND March, 2017
Brazilian Center for Research in Physics	RIO DE JANEIRO, BRAZIL June — July, 2016
Monash University	MELBOURNE, AUSTRALIA August — September, 2015
National University of Singapore	SINGAPORE August — September, 2013

Education

Federal Univeristy of São Carlos	SÃO CARLOS, BRAZIL
PhD degree in Theoretical Physics	2003 – 2008
Focused on quantum optics (open quantum systems) and the dynamical Casimir effect. Supervisor: Prof. Dr. Miled Hassan Youssef Moussa.	
São Carlos Institute of Physics, São Paulo University	SÃO CARLOS, BRAZIL
MSc degree in Theoretical Physics	2001 – 2003
Focused on non-symmetric gravity and quantum field theory in curved space-times. Supervisor: Prof. Dr. Silvertre Ragusa.	
São Paulo State University	RIO CLARO, BRAZIL
Bachelor degree in physics.	1997 – 2000

Awards and Fellowships

2000: Best academic performance in the graduating class.
2014: Since 2014 I hold the CNPq research fellow, which is awarded by CNPq (a major funding agency in the country) to the researchers that stand out among their peers.

Skills

Theoretical skills: Strong experience in quantum optics, quantum theory of open systems and quantum information. General theory of relativity and quantum field theory in curved space-times are also among my skills.

Experimental skills: Some knowledge in Nuclear Magnetic Resonance and Quantum Optics techniques developed due to long-term collaboration with experimental groups.

Natural languages: Portuguese (*mother language*), English (*full professional proficiency*)

Professional Services

- Referee for many scientific journals such as Reviews of Modern Physics, Physical Review Letters, Physical Review X, Physical Review X Quantum, Quantum Journal, Nature Communications, Physical Review A, Physical Review E, npj Quantum Information, among others.
 - Referee for the Brazilian funding agencies CNPq (National Council for Research and Development, Brazilian funding agency), FAPEG (Goiás state funding agency, Brazil) and National Research and Development Agency - ANID (Chile).
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Teaching

More than 10 years of teaching experience, including

- Undergrad courses — Quantum Mechanics, Electrodynamics, Experimental Physics, Thermodynamics, Quantum Information.
 - Graduate courses — Quantum Information, Quantum Thermodynamics, Relativistic Quantum Mechanics, General Relativity.
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Supervision

Concluded:

- 2 PhD
- 6 MsC (5 in Brazil and 1 in Spain)
- 8 Undergrad (7 in Brazil and 1 in Spain)
- 2 Post-Doc Researchers

Currently:

- 5 PhD
 - 2 MsC
 - 6 Undergrad
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Research Support

- Part of the National Institute for Science and Technology of Quantum Information (INCT - IQ) since 2012. The Institute provides regular financial support for research.
 - CNPq (grant number 304546/2019-4) — Total amount R\$ 47.800,00 (2020-2023)
 - FAPEG (PRONEX grant number 201710267000503) — Total amount R\$ 120.000 (2018 - 2022)
 - CNPq (grant number 305740/2016-4) — Total amount R\$ 47.800,00 (2018-2020)
 - CNPq (grant number 445516/2014-3) — Total amount R\$ 47.800,00 (2014-2018)
 - CNPq (grant number 314710/2014-0) — Total amount R\$ 338.157,55 (2014-2018)
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Full Publication List

Published articles

1. D. Ma, C. Jia, E. Solano and L. C. Céleri. Analogue gravitational lensing in optical Bose-Einstein condensates. *Universe* **9**, 443 (2023).
2. M. L. W. Basso, J. Maziero and L. C. Céleri. The irreversibility of relativistic time-dilation. *Class. Quantum Grav.* **40**, 195001 (2023).
3. L. C. Céleri, D. Huerga, F. Albarrán-Arriagada, E. Solano and M. Sanz. Digital-analog quantum simulation of fermionic models. *Phys. Rev. Applied* **19**, 064086 (2023).
4. M. Capela, H. Verma, F. Costa and L. C. Céleri. Reassessing thermodynamic advantage from indefinite causal order. *Phys. Rev. A* **107**, 062208 (2023).
5. J. Maziero, M. L. W. Basso and L. C. Céleri. Local predictability and coherence versus distributed entanglement in entanglement swapping from partially entangled pure states. *Phys. Lett. A* **457**, 128576 (2023).
6. G. H. Aguilar, T. L. Silva, T. E. Guimarães, R. S. Piera, L. C. Céleri and G. T. Landi. Two-point measurement of entropy production from the outcomes of a single experiment with correlated photon pairs. *Phys. Rev. A* **106**, L020201 (2022).
7. M. Capela, L. C. Céleri, R. Chaves and K. Modi. Quantum Markov monogamy inequalities. *Phys. Rev. A* **106**, 022218 (2022).
8. T. Gonzalez-Raya, R. Asensio-Perea, A. Martin, L. C. Céleri, M. Sanz, P. Lougovski, E. F. Dumitrescu. Digital-analog quantum simulations using the cross-resonance effect. *Phys. Rev. X Quant.* **2**, 020328 (2021).
9. D. P. Pires, K. Modi and L. C. Céleri. Bounding generalized relative entropies: non-asymptotic quantum speed limits. *Phys. Rev. E* **103**, 032105 (2021).
10. A. G. de Oliveira, R. M. Gomes, V. C. C. Brasil, N. Rubiano da Silva, L. C. Céleri and P. H. Souto Ribeiro. Full thermalization of a photonic qubit. *Phys. Lett. A* **384**, 126933 (2020).
11. B. O. Goes, G. T. Landi, E. Solano, M. Sanz and L. C. Céleri. Wehrl entropy production rate across a dynamical quantum phase transition. *Phys. Rev. Res.* **2**, 033419 (2020).
12. T. Häffner, G. L. Zanin, R. M. Gomes, L. C. Céleri and P. H. Souto Ribeiro. Remote preparation of single photon vortex thermal states. *The European Physical Journal Plus* **135**, 601 (2020).
13. P. H. Souto Ribeiro, T. Häffner, G. L. Zanin, N. Rubiano da Silva, R. Medeiros de Araújo, W. C. S. Silva, R. J. de Assis, L. C. Céleri and A. Forbes. Experimental study of the generalized Jarzynski's fluctuation relation using entangled photons. *Phys. Rev. A* **101**, 052113 (2020).
14. M. Capela, L. C. Céleri, K. Modi and R. Chaves. Monogamy of temporal correlations: Witnessing non-Markovianity beyond data processing. *Phys. Rev. Research* **2**, 013350 (2020).
15. T. Gonzalez-Raya, J. M. Lukens, L. C. Céleri and M. Sanz. Quantum memristors in frequency-entangled optical fields. *Materials* **13**, 864 (2020).
16. G. L. Zanin, T. Häffner, M. A. A. Talarico, E. I. Duzzioni, P. H. Souto Ribeiro, G. T. Landi and L. C. Céleri. Experimental quantum thermodynamics with linear optics. *Braz. J. Phys.* **49**, 783 (2019).
17. G. H. Aguilar, M. A. de Souza, R. M. Gomes, J. Thompson, M. Gu, L. C. Céleri and S. P. Walborn. Experimental investigation of linear-optics-based quantum target detection. *Phys. Rev. A* **99**, 053813 (2019).
18. J. P. Santos, L. C. Céleri, G. T. Landi and M. Paternostro. The role of quantum coherence in non-equilibrium entropy production. *npj Quant. Inf.* **5**, 23 (2019).
19. M. Capela, M. Sanz, E. Solano and L. C. Céleri. Kolmogorov-Sinai entropy and dissipation in driven classical Hamiltonian systems. *Phys. Rev. E* **98**, 052109 (2018).
20. E. G. Arrais, D. A. Wisniacki, L. C. Céleri, N. G. de Almeida, A. J. Roncaglia and F. Toscano. Quantum work for sudden quenches in Gaussian random Hamiltonians. *Phys. Rev. E* **98**, 012106 (2018).
21. L. C. Céleri and V. I. Kiosses. Unruh effect as a result of quantization of spacetime. *Phys. Lett. B* **781C**, 611 (2018).
22. J. P. Santos, L. C. Céleri, F. Brito, G. T. Landi and M. Paternostro. Spin-phase-space-entropy production. *Phys. Rev. A* **97**, 052123 (2018).
23. R. Medeiros de Araújo, T. Häffner, R. Bernardi, D. S. Tasca, M. P. J. Lavery, M. J. Padgett, A. Kanaan, L. C. Céleri and P. H. Souto Ribeiro. Experimental study of quantum thermodynamics using optical vortices. *J. Phys. Commun.* **2**, 035012 (2018).

24. F. Campaioli, F. A. Pollock, F. C. Binder, L. C. Céleri, J. Goold, S. Vinjanampathy and K. Modi. Enhancing the charging power of quantum batteries. *Phys. Rev. Lett.* **118**, 150601 (2017).
25. L. C. Céleri, V. Kiosses and D. R. Terno. Spin, localization and uncertainty of relativistic fermions. *Phys. Rev. A* **94**, 062115 (2016).
26. M. A. A. Talarico, P. B. Monteiro, E. C. Mattei, E. I. Duzzioni, P. H. Souto Ribeiro, L. C. Céleri. Work distribution in a photonic system. *Phys. Rev. A* **94**, 042305 (2016).
27. D. P. Pires, M. Cianciaruso, L. C. Céleri, G. Adesso and D. O. Soares-Pinto. Generalized geometric quantum speed limits. *Phys. Rev. X* **6**, 021031 (2016).
28. J. P. P. Silva, R. S. Sarthour, A. M. Souza, I. S. Oliveira, J. Goold, K. Modi, D. O. Soares-Pinto and L. C. Céleri. Experimental demonstration of information to energy conversion in a quantum system at the Landauer limit. *Proc. R. Soc. A* **472**, 20150813 (2016).
29. G. H. Aguilar, S. P. Walborn, P. H. Souto Ribeiro and L. C. Céleri. Experimental determination of multipartite entanglement with incomplete information. *Phys. Rev. X* **5**, 031042 (2015).
30. T. M. Carrijo, A. T. Avelar and L. C. Céleri. Quantum uncertainty in critical systems with three spins interaction. *J. Phys. B: At. Mol. Opt. Phys.* **48**, 125501 (2015).
31. D. P. Pires, L. C. Céleri and D. O. Soares-Pinto. Geometric lower bound for quantum coherence measure. *Phys. Rev. A* **91**, 042330 (2015).
32. K. Micadei, D. A. Rowlands, F. A. Pollock, L. C. Céleri, R. M. Serra and K. Modi. Coherent measurements in quantum metrology. *New J. Phys.* **17**, 023057 (2015).
33. L. C. Céleri, R. M. Gomes, R. Ionicioiu, T. Jennewein, R. B. Mann and D. R. Terno. Quantum control in foundational experiments. *Found. Phys.* **44**, 576 (2014).
34. J. G. Filgueiras, R. S. Sarthour, A. M. Souza, I. S. Oliveira, R. M. Serra and L. C. Céleri. Quantum delayed-choice experiment in an environment with arbitrary white noise. *J. Phys. A: Math. Theor.* **46**, 245301 (2013).
35. J. Maziero, R. Auccaise, L. C. Céleri, D. O. Soares-Pinto, E. R. deAzevedo, T. J. Bonagamba, R. S. Sarthour, I. S. Oliveira and R. M. Serra. Quantum discord in nuclear magnetic resonance systems at room temperature. *Braz. J. Phys.* **43**, 86 (2013).
36. K. Micadei, R. M. Serra and L. C. Céleri. Thermodynamic cost of acquiring information. *Phys. Rev. E* **88**, 062123 (2013).
37. R. Auccaise, R. M. Serra, J. G. Filgueiras, R. S. Sarthour, I. S. Oliveira and L. C. Céleri. Experimental analysis of the quantum complementarity principle. *Phys. Rev. A* **85**, 032121 (2012).
38. J. Maziero, L. C. Céleri, R. M. Serra and M. S. Sarandy. Long-range quantum discord in critical spin systems. *Phys. Lett. A* **376**, 1540 (2012).
39. M. A. Silva Jr., R. M. Serra and L. C. Céleri. Observer invariance of the collapse postulate of quantum mechanics. *Int. J. Mod. Phys. B* **27**, 1345013 (2012).
40. D. O. Soares-Pinto, R. Auccaise, J. Maziero, A. Gavini-Viana, R. M. Serra and L. C. Céleri. On the quantumness of correlations in nuclear magnetic resonance. *Phil. Trans. R. Soc. A* **370**, 4821 (2012).
41. R. Auccaise, L. C. Céleri, D. O. Soares-Pinto, E. R. deAzevedo, J. Maziero, A. M. Souza, T. J. Bonagamba, R. S. Sarthour, I. S. Oliveira and R. M. Serra. Environment-induced sudden transition in quantum discord dynamics. *Phys. Rev. Lett.* **107**, 140403 (2011).
42. D. O. Soares-Pinto, M. H. Y. Moussa, J. Maziero, E. R. deAzevedo, T. J. Bonagamba, R. M. Serra and L. C. Céleri. Equivalence between Redfield and master equation approaches for a time-dependent quantum system and coherence control. *Phys. Rev. A* **83**, 062336 (2011).
43. R. Auccaise, J. Maziero, L. C. Céleri, D. O. Soares-Pinto, E. R. deAzevedo, T. J. Bonagamba, R. S. Sarthour, I. S. Oliveira and R. M. Serra. Experimentally witnessing the quantumness of correlations. *Phys. Rev. Lett.* **107**, 070501 (2011).
44. L. C. Céleri, J. Maziero and R. M. Serra. Theoretical and experimental aspects of quantum correlations beyond entanglement. *Int. J. Quant. Inf.* **9**, 1837 (2011).
45. D. O. Soares-Pinto, L. C. Céleri, R. Auccaise, F. F. Fanchini, E. R. deAzevedo, J. Maziero, T. J. Bonagamba and R. M. Serra. Nonclassical correlation in NMR quadrupolar systems. *Phys. Rev. A* **81**, 062118 (2010).
46. J. Maziero, H. C. Guzman, L. C. Céleri, M. S. Sarandy and R. M. Serra. Quantum and classical thermal correlations in the XY spin-1/2 chain. *Phys. Rev. A* **82**, 012106 (2010).
47. L. C. Céleri, A. G. S. Landulfo, R. M. Serra and G. E. A. Matsas. Sudden change in quantum and classical correlations and the Unruh effect. *Phys. Rev. A* **81**, 062130 (2010).

48. J. Maziero, T. Werlang, F. F. Fanchini, L. C. Céleri and R. M. Serra. System-reservoir dynamics of quantum and classical correlations. *Phys. Rev. A* **81**, 022116 (2010).
49. L. C. Céleri, F. Pascoal and M. H. Y. Moussa. Action of the gravitational field on the dynamical Casimir effect. *Class. Quant. Grav.* **26**, 105014 (2009).
50. J. Maziero, L. C. Céleri, R. M. Serra and V. Vedral. Classical and quantum correlations under decoherence. *Phys. Rev. A* **80**, 044102 (2009).
51. F. Pascoal, L. C. Céleri, S. S. Mizrahi, M. H. Y. Moussa, C. Farina. Dynamical Casimir effect for a massless scalar field between two concentric spherical shells with mixed boundary conditions. *Phys. Rev. A* **80**, 012503 (2009).
52. L. C. Céleri, F. Pascoal, M. A. de Ponte and M. H. Y. Moussa. Number of particle creation and decoherence in the nonideal dynamical Casimir effect at finite temperature. *Ann. Phys.* **324**, 2057 (2009).
53. F. Pascoal, L. C. Céleri, S. S. Mizrahi and M. H. Y. Moussa. Dynamical Casimir effect for a massless scalar field between two concentric spherical shells. *Phys. Rev. A* **78**, 032521 (2008).
54. L. C. Céleri, M. A. de Ponte, C. J. Villas-Boas and M. H. Y. Moussa. Switching off the reservoir through nonstationary quantum systems. *J. Phys. B: At. Mol. Opt. Phys.* **41**, 085504 (2008).
55. S. Ragusa and L. C. Céleri. Ghost free analysis of a nonsymmetric theory of gravitation. *Braz. J. Phys.* **33**, 821 (2003).
56. S. Ragusa and L. C. Céleri. Solar gravitational deflection of a graviton. *Gen. Relat. Gravit.* **35**, 1125 (2003).

Preprints

1. R. C. Souza Pimenta, G. H. dos Santos, A. B. Barreto, L. C. Céleri and P. H. Souto Ribeiro. Photonic entanglement with accelerated light. <https://arxiv.org/abs/2308.01764> (2023).
2. T. H. Moreira and L. C. Céleri. Decoherence of a composite particle induced by a weak quantized gravitational field. <https://arxiv.org/abs/2308.07454> (2023).
3. G. Oliveira and L. C. Céleri. Thermodynamic entropy production in the dynamical Casimir effect. <https://arxiv.org/abs/2309.07847> (2023).
4. D. Ma, E. Solano, C. Jia and L. C. Céleri. Analogue Penrose process in rotating acoustic black hole. <https://arxiv.org/abs/2205.01454> (2022).
5. L. C. Céleri and Ł. Rudnicki. Gauge invariant quantum thermodynamics: consequences for the first law. <https://arxiv.org/abs/2104.10153> (2021).
6. D. Borim, L. C. Céleri and V. I. Kiosses. Precision in estimating Unruh temperature. <https://arxiv.org/abs/2001.09085> (2020).
7. L. C. Céleri and V. I. Kiosses. Accelerated quantum fields: quantization of space-time due to acceleration. <https://arxiv.org/abs/1712.05206> (2017).
8. K. Modi, L. C. Céleri, J. Thompson and M. Gu. Fragile states are better for quantum metrology. <http://arxiv.org/abs/1608.01443> (2016).
9. J. Maziero, L. C. Céleri and R. M. Serra. Suitability of symmetric and asymmetric versions of the quantum discord. <http://arxiv.org/abs/1004.2082> (2010).
10. A. V. Dodonov, L. C. Céleri, F. Pascoal, M. D. Lukin and S. F. Yelin. Photon generation from vacuum in non-stationary circuit QED. <http://arxiv.org/abs/0806.4035> (2008).

Other productions

1. L. C. Céleri and J. Maziero. The sudden change phenomenon of quantum discord. Contribution to “Lectures on general quantum correlations and their applications”, edited by F. F. Fanchini, D. O. Soares-Pinto and G. Adesso (Springer, 2017). <https://arxiv.org/abs/1610.02882> (2017).

Citations — 15/11/2022

1. *Google Scholar* - 3.103 (h index: 20).
 2. *Web of Science* - 1.983 (h index: 17).
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Scientific Events

I have presented invited talks in several universities both in Brazil and overseas. Beyond this, I organized and attended many scientific events. Bellow I present a list of some of them.

Organization

1. Workshop on Quantum Speed Limits and Thermodynamics. Bilbao, Spain (2020).
2. II Workshop on Quantum Information and Thermodynamics. Natal, Brazil (2019).
3. Workshop on Quantum Information and Thermodynamics. São Carlos, Brazil (2015).
4. NMR Quantum information processing. Rio de Janeiro, Brazil (2013).
5. Workshop on quantum correlations: Entanglement, discord and beyond. Natal, Brazil (2012).

Participation

1. II International Workshop on Quantum Nonstationary Systems. Brasilia, Brazil (2023).
2. VIII Paraty Quantum Information School and Workshop. Paraty, Brazil (2023).
3. 13th KCIK-ICTQT Symposium on Quantum Information. Gdąnski, Poland (2022).
4. Workshop on Quantum Thermodynamics. Curitiba, Brazil (2019).
5. Modern Topics in Quantum Information. Natal, Brazil (2018).
6. Autumn Meeting of the Brazilian Physical Society. Foz do Iguaçu, Brazil (2018).
7. Nanyang Quantum 2017 - Workshop on Quantum Resources and Correlations Beyond Entanglement. Singapore (2017).
8. Fifth conference on quantum thermodynamics. Oxford, England (2017).
9. Third conference on quantum thermodynamics. Porquerolles, France (2015).
10. ENFMC. Foz do Iguaçu, Brazil (2015).
11. Quantum science: Implementations. Benasque, Spain (2014).
12. Relativistic quantum information. Nottingham, UK (2013)
13. Coherent control of complex quantum systems. Okinawa, Japan (2013).
14. Quantum information and foundations of thermodynamics. Zurich, Switzerland (2011).
15. DICE2010 - Space-time-matter - Current issues in quantum mechanics and beyond. Castiglioncello, Italy (2010).
16. Quantum information school and workshop. Paraty, Brazil (2009).
17. Workshop on 60 years of Casimir effect. Brasília, Brazil (2008).
18. Quantum optcs III. Pucón, Chile (2006).
19. Iconne 2000. Campos do Jordão, Brazil (2000).