

Alejandro CÁRDENAS-AVENDAÑO

Montana State University

a.cardenasavendano@montana.edu

Fundación Universitaria Konrad Lorenz

alejandro.cardenasa@konradlorenz.edu.co

24 years old
Born in Bogotá D.C
Colombia

Education

- 2016-- MONTANA STATE UNIVERSITY
eXtreme Gravity Institute
Ph.D. in Physics.
Advisor: Prof. Nicolás Yúnes.
August 2016 - -
- 2016 UNIVERSIDAD NACIONAL DE COLOMBIA
Observatorio Astronómico Nacional
M.Sc. (magna cum laude) in Astronomy.
Thesis: "Probing the regular nature of the spacetime by direct measurement of black hole properties"
August 2014 - September 2015
- 2014 UNIVERSIDAD NACIONAL DE COLOMBIA
Departamento de Física
B.Sc. in Physics.
January 2009 - June 2014
- 2013 FUNDACIÓN UNIVERSITARIA KONRAD LORENZ
Facultad de Matemáticas e Ingenierías
B.Sc. (summa cum laude) in Mathematics
January 2009 - June 2013

Research Interests

Gravitation, Astrophysics, Testing GR and Alternative Theories of Gravity.

Honors and Awards

- 2016 Scientific Publication Incentive, Fundación Universitaria Konrad Lorenz May 2016.
- 2016 Graduate Meritorious Fellowship. Montana State University, February 2016.
- 2015 Honors (*magna cum laude*) M.Sc. thesis in Astronomy. Universidad Nacional de Colombia, September 2015.
- 2015 Distinguished Young Investigator Science Award. Fundación Universitaria Konrad Lorenz, May 2015.

- 2014 Graduate Teaching Assistant Scholarship, National Astronomical Observatory of Colombia, National University of Colombia.
- 2014 Distinguished Young Investigator Science Award. Fundación Universitaria Konrad Lorenz, May 2014.
- 2013 Honors B.Sc. in Mathematics. Fundación Universitaria Konrad Lorenz, September 2013.
- 2013 Honors (*summa cum laude*) B.Sc. in Mathematics. Konrad Lorenz University, September 2013.
- 2012 First-prize in essay competition on the fight against drugs: "*Con la Droga no solo mueres tú*", Embassy of the United States of America, United Nations Office on Drugs and Crime and the Ministry of Justice and Law of Colombia. Essay title: "El potencial de la búrbuja".

Teaching Experience

- 2016 Teaching Assistant, Department of Physics, Montana State University, United States of America. 205 Labs.
- 2013- Lecturer, Department of Mathematics, Fundación Universitaria Konrad Lorenz, Bogotá, Colombia. Undergraduate Courses Taught: *Ordinary differential equations, Partial differential equations, Introduction to Scientific Computing.*
- 2016 Instructor, Summer Program for High School Students, Clubes de Ciencia Colombia 2016. Universidad Nacional de Colombia.

Research Experience

- 2015-2016 Visitor at **Fudan University**, Shanghai, China. (19/05/2014 - 25/06/2014) and (17/11/2015 - 30/01/2016). *Project: Black Hole Astrophysics.*
Supervisor: *Cosimo Bambi* (bambi@fudan.edu.cn).
- 2015 Researcher under the Visiting Graduate Fellows program at **Perimeter Institute for Theoretical Physics**, Waterloo, Canada. (24/02 - 14/04). *Project: Numerical Relativity.*
Supervisor: *Luis Lehner* (llehner@perimeterinstitute.ca).
- 2012 Summer internship at EU Universe Awareness educational program at department of Astronomy of **Leiden University**, the Netherlands. *Projects: Research on Open Educational Repositories, Evaluation of Astronomy for Development and Public Outreach initiatives.*
Supervisor: *Pedro Russo* (russo@strw.leidenuniv.nl).

Conferences, Workshops and Schools

- 2016 Attended at *26th Midwest Relativity Meeting*, **Perimeter Institute for Theoretical Physics**, Waterloo, Canada. Talk presented: "*A study for testing the Kerr metric with AGN iron line eclipses*".

- 2016 Attended at 21st International Conference on General Relativity and Gravitations, **Columbia University**, New York, United States of America. Talk presented: "A model for testing strong gravity via X-ray reflection spectroscopy". Poster presented: "Wormholes and nonsingular space-times in Palatini $f(R)$ gravity".
- 2015 Attended at New Spaces in Mathematics and Physics, **Institut Henry Poincaré**, Paris, France.
- 2015 Attended at Recent Advances in Mathematical General Relativity, **Institut Henry Poincaré**, Paris, France.
- 2015 Introductory school: Introduction to mathematical general relativity, **Institut Henry Poincaré**, Paris, France.
- 2015 Extreme Gravity Workshop in Bozeman, **Monstana State University**, Bozeman, United States of America.
- 2015 Workshop on Astrophysics and Relativity: Astro-GR 2015, **ICTP South American Institute for Fundamental Research**, Sao Paulo, Brazil.
- 2015 School on Gravitational Waves: from data to theory and back, **ICTP South American Institute for Fundamental Research**, Sao Paulo, Brazil. Talk presented: "Regular black holes based on smeared mass distributions".
- 2015 Attended at Superluminality in Effective Field Theories for Cosmology, **Perimeter Institute for Theoretical Physics**, Canada.
- 2014 Attended at X Latin American Symposium of High Energy Physics (SILAE), **Universidad de Antioquia**, Colombia. Poster presented: "Electrostatic Self-energy of a Charged Particle in the Surroundings of a Topologically Charged Black Hole in the Brane".
- 2014 Attended at EHT 2014, **Perimeter Institute for Theoretical Physics**, Canada. Poster presented: "Probing the regular nature of the spacetime by measuring the shadow of a black hole".
- 2014 XIX Ciclo de Cursos Especiais, Advanced School in Astrophysics, **Observatório Nacional de Brasil no Rio de Janeiro**, Rio de Janeiro, Brazil. Poster presented: "Gravitational Lensing in String and Einstein Frames".
- 2014 Physics School on General Relativity @ 99, **Deutsche Physikalische Gesellschaft**, Physikzentrum, Bad Honnef, Germany.
- 2014 Attended at International Conference Boltzmann, Vlasov and related equations: Last results and open problems, **Universidad de Cartagena**, Cartagena, Colombia.
- 2013 SciCoder 2013, **New York University**, United States of America.
- 2012 XVII Ciclo de Cursos Especiais, Advanced School in Astrophysics, **Observatório Nacional de Brasil no Rio de Janeiro**, Brazil.
- 2012 International Summer School. Solar Astrophysics: Modern Trends and Techniques. **Universidad Nacional de Colombia**, Colombia.
- 2011 XVI Ciclo de Cursos Especiais, Advanced School in Astrophysics, **Observatório Nacional de Brasil no Rio de Janeiro**, Brazil.

2011 *First School on Numerical Relativity*. **Universidad Nacional de Colombia**, Colombia.

Organizing events

2016 Member of the Local Organizing Committee of the *Communicating Astronomy with the Public 2016 (CAP 2016)* conference, Medellín, Colombia.

Online Courses

2015 *Philosophy and the Sciences*, Online Offering by Coursera. **The University of Edinburgh**.

2014 *AstroTech: The Science and Technology behind Astronomical Discovery*, Online Offering by Coursera. **The University of Edinburgh**.

2013 *Galaxies and Cosmology*, Online Offering by Coursera (Distinction). **California Institute of Technology**.

2013 *From the Big Bang to Dark Energy*, Online Offering by Coursera. **The University of Tokyo**.

Affiliations

2016-- Member of the International Society on General Relativity and Gravitation (ISGRG)

2012-2016 Universe Awareness (UNAWA) Student Ambassador. Leiden Observatory, Leiden University.

Computer Skills

Programming: Python, C/C++.

Scientific: Maple, Mathematica.

Language Skills

Fluent: English (TOEFL iBT, Test Date:31 Jan 2015, **Total Score: 101**), Portuguese

Basic: German

Mother Tongue: Spanish

Thesis

2015 **A. Cárdenas-Avendaño**, "*Probing the regular nature of the spacetime by direct measurement of black hole properties*". Master's Thesis. Universidad Nacional de Colombia. SINAB Code: **51140**. Online version: <http://www.bdigital.unal.edu.co/51140/>

Publications

- 2016 C. Bambi, **A. Cardenas-Avendano**, T. Dauser, J. A. Garcia, S. Nampalliwar, “Testing the Kerr black hole hypothesis using X-ray reflection spectroscopy”. [arXiv: 1607.00596 [gr-qc]]. Submitted to ApJ.
- 2016 Z. Cao, **A. Cardenas-Avendano**, M. Zhou, C. Bambi, C. A. R. Herdeiro, E. Radu, “Iron $K\alpha$ line of boson stars”. Journal Of Cosmology And Astroparticle Physics, **10** (2016) 003.
- 2016 Y. Ni, M. Zhou, **A. Cardenas-Avendano**, C. Bambi, C. A. R. Herdeiro, E. Radu, “Iron $K\alpha$ line of Kerr black holes with scalar hair”. Journal Of Cosmology And Astroparticle Physics, **07** (2016) 049.
- 2016 M. Zhou, **A. Cárdenas-Avendaño**, C. Bambi, B. Kleihaus, J. Kunz, “Search for astrophysical rotating Ellis wormholes with X-ray reflection spectroscopy”. Physical Review D **94**, 024036.
- 2016 **A. Cárdenas-Avendaño**, J. Jiang, C. Bambi, “Testing the Kerr black hole hypothesis: comparison between the gravitational wave and the iron line approaches”. Physics Letters B **760** 254–258.
- 2016 **A. Cárdenas-Avendaño**, J. Jiang, C. Bambi, “A study for testing the Kerr metric with AGN iron line eclipses”. Journal Of Cosmology And Astroparticle Physics, **04** (2016) 054.
- 2016 C. Bambi, **A. Cárdenas-Avendaño**, G. Olmo, D. Rubiera-Garcia, “Wormholes and nonsingular spacetimes in Palatini $f(R)$ gravity”. Physical Review D **93**, 064016.
- 2015 C. Benavides, **A. Cárdenas-Avendaño**, A. Larranaga, “Gravitational lensing in the strong field limit for Kar’s metric”. International Journal of Theoretical Physics, **55**, 4.
- 2015 A. Larranaga, **A. Cárdenas-Avendaño**, D. Torres, “Electrostatic Self-energy of a Charged Particle in the Surroundings of a Topologically Charged Black Hole in the Brane”. Romanian Journal of Physics **60**, 27.
- 2014 **A. Cárdenas-Avendaño**, “Hilbert-Pólya Conjecture”. (In spanish) Lecturas Matemáticas, **35** (2).
- 2013 V. Ribeiro, P. Russo, **A. Cárdenas-Avendaño**, “A Survey of Astronomical Research: A Baseline for Astronomical Development”. The Astronomical Journal **146**, 138.
- 2012 A. Larranaga, **A. Cárdenas-Avendaño**, “Geometric Thermodynamics of Schwarzschild-AdS black hole with a Cosmological Constant as State Variable”, Journal of the Korean Physical Society, **60**, No 7.

References (reference letters may be submitted upon request)

Ph.D. Nicolás **Yunes**
Associate Professor
Montana State University
nyunes@physics.montana.edu

Ph.D. Cosimo **Bambi**
Xie Xide Junior Chair Professor
Fudan University
bambi@fudan.edu.cn

Ph.D. Luis **Lehner**
Faculty
Perimeter Institute for Theoretical Physics
Associate Professor
Waterloo University and University of Guelph
llehner@perimeterinstitute.ca

Ph.D. Diego **Rubiera-Garcia**
Researcher
Institute of Astrophysics and Space Sciences (IA)
drgarcia@fc.ul.pt