

Gustavo Cesar Valdivia Mera

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1 Education and achievements

1.1 M.Sc. in High Energy Physics, ICTP-EAIFR

09/2020 - 10/2022

East African Institute for Fundamental Research (ICTP-EAIFR)

University of Rwanda. Kigali, Rwanda.

Institutional e-mail: gvaldivia@eaifr.org

The Abdus Salam International Centre for Theoretical Physics (ICTP)

2nd year of the M.Sc. program (09/2021 - 09/2022)

ICTP-Postgraduate Diploma Program. (ONLINE)

1.2 Professional Title in Physics

Obtained by a thesis defense.

Universidad Nacional Mayor de San Marcos

Faculty of Physical Science. Lima, Peru.

Thesis:

On the subjacent relation to Quantum Entanglement and Wormholes: $ER = EPR$.

08/2018

Grant received

Winner of the scholarship contest organized by the vice-chancellor for research of the university.

03/2019

Thesis defense

Grade : 18 out of 20.

Mention : **Outstanding**.

02/2020

Professional title received.

1.3 Bachelor of Sciences in Physics

Degree obtained after successfully complete the 5-year program focused on Theoretical Physics.

Universidad Nacional Mayor de San Marcos

Faculty of Physical Science. Lima, Peru.

03/2012

Start date.

12/2016

End date.

05/2017

Bachelor degree received.

Qualifications

B.Sc. Degree : Overall grade of **15.8** out of **20**.

Rank : **First** of the graduating class (21 students).

Equivalent GPA : **4.0** - According to McGill University.

Majors

- Advanced Topics I: General Relativity : Grade of 16/20.
- Advanced Topics II: Nuclear Physics : Grade of 19/20.
- High Energy Physics: Review of QED and QCD : Grade of 18/20.
- Seminar I: Group Theory and Classical Field Theory : Grade of 18/20.
- Seminar II: Introduction to Quantum Field Theory : Grade of 20/20.

1.4 Academic Achievements

I. Academic performance awards received at the opening ceremony of academic year in the Faculty of Physical Sciences (Universidad Nacional Mayor de San Marcos):

03/2013 Academic Performance Ranking : 2nd out of 100 students.

03/2014 Academic Performance Ranking : 3rd out of 100 students.

03/2015 Academic Performance Ranking : 2nd out of 60 students.

03/2016 Academic Performance Ranking : 1st out of 60 students.

03/2017 Academic Performance Ranking : 1st out of 21 students.

II. Highest grade obtained in a single period:

2016 - 2 Grade of 20 out of 20.

2 Research Experience

2.1 Articles

2021 Anomalous changing angular momentum of hairy black holes geodesics

Abstract: We study the motion of test particles and the propagation of light around neutral hairy black holes under the influence of a self-interacting real scalar field minimally coupled to gravity. It is highly relevant in the context of recent observations of the Event Horizon Telescope: *The Shadow of the supermassive Black Hole* and *The Shadow and Mass of the Central Black Hole*. The goal of the present work is to show that the time-like and null-like geodesics have an anomalous behaviour for a special range of parameters in the dense hair region, defined as $\sqrt{\Omega(x_h)} \leq r \leq 2MG_N/c^2$. When the geodesics are in the dense hair region, they lose their angular momenta and enter the horizon.

2020 A review on the Unruh Effect and the Thermofield-double state
e-Print in arXiv.

2.2 Research Groups

2019 - Present **Fundamental Physics Group**

We actively work in this group developing fundamental topics of Theoretical and Computational Physics, we also currently carry out research on gravitation with the purpose of contributing to the scientific community through the production of scientific articles. This group is made up of Peruvian researchers.

2015 - 2019 **Theoretical Physics Group**

Universidad Nacional Mayor de San Marcos

As a member of this group during the undergraduate I had the opportunity to enrich my knowledge through discussion sessions, seminars and research projects, under the supervision of Ph.D. Teófilo Vargas (Head of the Theoretical Physics Group), which were presented at the main scientific events in Peru (section 2.3). Besides, I gave introductory lectures, in relation to my major subjects, to group members as well as students from other universities. In that sense, being part of this group allowed me to focus on theoretical physics.

2.3 Presentations

Some of the research projects that I performed, in form of lectures and poster, at the main scientific events in Peru.

08/2015 **Introduction to General Relativity**

III Regional Symposium of Physics
Universidad Nacional del Callao. Lima, Peru.

11/2015 **Black Hole and Thermodynamics**

XXIV Peruvian Symposium of Physics
Universidad Nacional Mayor de San Marcos. Lima, Peru.

11/2015 **Gravitational Collapse, Black Holes and Thermodynamics**

Physics Week 2015
Universidad Nacional Mayor de San Marcos. Lima, Peru.

01/2016 **QFT in Non-Inertial Reference Frames: Unruh Effect**

X Theoretical Physics at the Rimac River
Universidad Nacional de Ingeniería. Lima, Peru.

10/2016 **Introduction to the AdS/CFT correspondence**

XXV Peruvian Symposium of Physics
Pontificia Universidad Católica del Perú. Lima, Peru.

11/2017 **On the subjacent relation to Quantum Entanglement and Wormholes: $ER = EPR$ (First version)**

Physics Week 2017
Universidad Nacional Mayor de San Marcos. Lima, Peru.

3 Schools on Theoretical Physics

Some important schools on Theoretical Physics that I attend.

05/2016 **School on Fundamental Aspects of String Theory**

IFT-UNESP. São Paulo, Brasil

06/2017 **UDEC School: String Theory 2017**

Faculty of Physical and Mathematical Sciences
Universidad de Concepción. Concepción, Chile

- 09/2017 Minicourse on Machine Learning for many-body Physics**
IFT-UNESP. São Paulo, Brasil
- 01/2018 Holography and Supergravity 2018**
Universidad Adolfo Ibañez. Viña del Mar, Chile
- 01/2018 Summer school on Theoretical Physics UACH 2018**
Faculty of Physical and Mathematical Sciences
Universidad Austral de Chile. Valdivia, Chile.
- 11/2018 I School of Holography and Entanglement Entropy**
Faculty of Physical Sciences
Universidad Nacional Mayor de San Marcos. Lima, Peru.
- 04/2019 Gravity at Ucen 2019**
Universidad Central. Santiago, Chile.
- 11/2020 African Physical Society International Conference**
Online
- 01/2021 IV Joint ICTP-Trieste/ICTP-SAIFR School on Cosmology:
Challenges for the Standard Cosmological Model**
Online

4 Social and Academic Responsibilities

2015/2016 President - Physics Student Centre

I encouraged a group of good students in order to work together for our home faculty. In consequence, we created the Physics Student Centre in 2015 as an organism responsible for developing academic activities and supporting students. As president of this organism I guided my team to the accomplishment of all the activities that we established at the beginning of our period. Even today students from my faculty continue with this responsibility, not only in the academic, but in the artistic and social. It is important to mention that we have the recognition of the authorities of the faculty and university.

Some important activities we organized:

- Introductory classes for new students.
- Reconstruction of the old student's library.
- Organization of the 1st Meeting of Nuclear and Medical Physics.

2016 Member of *Campos y Cuerdas* (Fields and Strings)

This is an initiative created by Alejandro de la Puente (Analyst at United States Department of Defense), a remarkable Peruvian particle physicist. The aim of this group is to create ties between different research groups in Peru by making video-conference on Quantum Field Theory, General Relativity and related topics, in which I continuously participated giving video-conference, and organizing scientific events as an active member in Lima, Peru.

Some important video-conference we organized:

- Juan Maldacena: AdS/CFT Correspondence (video-conference).
- Introduction to General Relativity (video-conference).
- Mini-course on Cosmic Ray Physics (video-conference).

You may find the video-conferences in *Campos y Cuerdas* YouTube Channel

5 Work Experience

10/2022 - Present

Colegio PAMER - Lima, Peru

Department of Science

Physics teacher

03/2020 - 08/2022

Universidad Privada del Norte - Lima, Peru

Department of Science

Teaching assistant of Physics

03/2019 - 12/2019

Academia Olympia - Lima, Peru

Online Mathematics and Physics tutoring

04/2018 - 06/2018

TECSUP - Lima, Peru

Department of General Studies

Teacher of Physics

05/2017 - 08/2017

Editorial Santa María - Lima, Peru

Academic textbook technical editor

03/2017 - 12/2017

Universidad de Ingeniería y Tecnología (UTEC) - Lima, Peru

Department of Mathematics

Teaching assistant of Mathematics

03/2016 - 12/2016

Universidad Nacional Mayor de San Marcos - Lima, Peru

Faculty of Physical Science

Teaching assistant of General Relativity and Quantum Mechanics

03/2015 - 11/2015

Seminario Permanente de Astronomía y Ciencias Espaciales (SPACE)

Universidad Nacional Mayor de San Marcos - Lima, Peru

Research on Black Holes Thermodynamics

Results presentation: XXIV Peruvian Symposium of Physics