

Daniel Panizo | Cover Letter

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Dear employer,

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The purpose of this letter is that of applying for a postdoc position in theoretical physics within your department/division. I am currently a Ph.D. student, under the supervision of Prof. [Ulf Danielsson](#), in the string cosmology group of the department of Physics and Astronomy of the University of Uppsala.

My professional profile is outlined in detail in the enclosed CV and the other files in attachment (available also in [my personal webpage](#)). It shows an evergrowing conceptual background knowledge combined with widening communication and computational skills, dressed with enthusiasm and diligence to the research world. Furthermore, it is not only my personal and professional growth, but also those I surround with, what I seek. This translates to a very positive attitude towards educational and pedagogical activities, such as teaching, supervising students and scientific outreach outside academia.

My research interests include various topics in string phenomenology and cosmology with a particular focus on model building capable of reproducing dark energy from higher dimensions, as well as the relation between swampland conjectures and our current observational evidence. In the immediate future, I would like to continue enhancing the dark bubble cosmology model and start exploring further connections between the swampland framework and cosmological observations. More information can be found in the enclosed file named "Statement of Purpose". Let me now analyse my past career path and all the experiences that took me to this point.

A dagger, designed and sharpened to the point that it cuts the fabric of spacetime, is responsible for my interest in theoretical physics. This object of a fantasy novel (*His Dark Materials*) is imagined from the idea that our Universe could belong to a set of them, stacked through one extra dimension, only accessible to those carrying such knife. This fictional idea rapidly grew inside me during my high school years, triggering a deep interest in fundamental physics and more specially, in cosmology. Years after, I was firmly entering through the main door of the physics faculty building.

After completing my bachelor in physics at Universidad Complutense de Madrid (Spain), and equipped with a flourishing modest knowledge in fundamental physics, I was accepted to study my master in theoretical physics at Uppsala University (Sweden). A new environment, complemented with a master program that provides freedom to learn at each student's pace, boosted further my most fundamental thirst of knowledge. An emerging professional maturity, acquired through academic (and also everyday) experience, was in charge to tame the primeval motivation, decomposing its big questions into smaller, more manageable ones. "Manageable" questions of the form: **Why does the Universe have four dimensions?** or, **Why does the Universe (apparently) expand?** guided my steps towards the string theory framework and its applications to cosmology. As a culmination to the two year quantum fields and strings master program, I devoted 45 out of its 120 ECTS credits to string cosmology aspects:

- My **Master thesis**, supervised by [Prof. Giuseppe Dibitteto](#), where I explored flux compactifications of ten dimensional supergravities to four dimensional effective Anti de Sitter (AdS) vacua. Although the results could mathematically differ in aspect from each other, they can secretly represent the same physics. If they do, there is always a set of reparametrisations (dualities) that can be performed to connect those solutions.
- Furthermore, I decided to extend my studies in dualities with an **addendum-like 15 ECTS project**, where I studied the (non) geometrical and algebraic properties of generalised fluxes both in IIA and IIB supergravity theories. This project was supervised by [Prof. Dieter Lüst](#), who personally accepted my

research proposal, and thanks to an Erasmus+ program grant, I became a visitor student at Ludwig Maximilian University in Munich during autumn 2018. In addition to the European grant, I was awarded with the Swedish Lundström-Åman grant, which allowed me to extend the project and research during spring 2019.

These two projects, although exciting and thirst-knowledge alleviating, were not enough. As it is the norm in research, the deeper you look down into a question, the more it scatters into more fundamental ones. It requires to go beyond in erudition, which continues by doctoral studies.

It was spring 2019, when I was informed that the Center of Interdisciplinary Mathematics (CIM), which belongs to Uppsala University's Mathematics department, was willing to allow me present my own Ph.D. research proposal to its committee. This was an unique procedure, as it is normally the potential supervisor (and not the candidate) who proposes the research plan and the CIM board decides if it is worth to offer to applicants. I think the nominating board liked my proactivity and research plan proposition, which in addition to the support of my current supervisors (Prof. Ulf Danielsson, Prof. **Tobias Ekholm** and Prof. **Georgios Dimitroglou**), resulted in my proposal being elected to become a Ph.D. position. This I happily accepted, as I had already fallen in love with the peaceful life style Uppsala provides, after two years and a half living in the city. A feeling that gently pushed me to learn the beautiful language that Swedish is, which helped me to become fully integrated in the local environment.

I have been extremely lucky to continue researching along my primal adolescent motivation during these last four years. Together with Prof. Ulf Danielsson, and with esporadic collaborations with Prof. **Thomas Van Riet** and other researchers across Europe and USA, we have been able to push the boundaries of the string cosmology state of art, by enhancing an alternative to compactifications, in the form of a braneworld scenario called **dark bubble cosmology** (more details in the statemente of purpose). We have made the model grow robust, with each of its features compatible with observations. Without hesitation, I would affirm that my greatest achievement is that of modeling a consistent "top-down" construction of dark bubbles from string theory. Every time the puzzle pieces of each research project start to fit, joy and shivers rank up my passion for string phenomenology.

Over my Ph.D. years, simultaneously to all research, I decided to actively broaden my knowledge across disciplines beyond physics, and I took courses in philosophy, religion, mathematics, programming, economics, Swedish... which have granted me new technical capabilities and different point of views in respect to research implications and academic work. Furthermore, I have enthusiastically performed my duties as teacher assistant of subjects like electrodynamics and general relativity, selecting the most pedagogical examples and applying my best didactical competences when teaching or tutoring to the students, aiming to provide them the best possible learning.

And this is where I stand now. In the meantime my research and personal interests got broader and broader and my research line is maturing. I feel ready to take the next step in my research career and become a postdoc, with all the associated responsibilities and exciting new research to unriddle. I do think that we are living in an exciting era for our understanding of the cosmos, which sooner than later will be boosted further if the scientific community, which I would like to continue being part of, carries on unraveling the Universe and its mysteries.

Yours faithfully,

Daniel Panizo