

# **Dynamics of coupled quantum systems** Ohanesjan, V.

#### Citation

Ohanesjan, V. (2024, February 7). *Dynamics of coupled quantum systems*. *Casimir PhD Series*. Retrieved from https://hdl.handle.net/1887/3716227

Version: Publisher's Version

Licence agreement concerning inclusion of doctoral

License: thesis in the Institutional Repository of the University

of Leiden

Downloaded from: <a href="https://hdl.handle.net/1887/3716227">https://hdl.handle.net/1887/3716227</a>

**Note:** To cite this publication please use the final published version (if applicable).

# Acknowledgements

Firstly I would like to thank my supervisors Koenraad Schalm and Jan Zaanen for their guidance and support during my Ph.D. journey. I am especially grateful for the freedom, they provided me with, to explore and work on topics that sometimes were not in the main focus of the group. However, my direct supervisor Koenraad Schalm was always willing to discuss and provide valuable insights on any topic of my interest. While at times this approach proved to be more challenging than I expected, it was worth it all along since, in my opinion, it was the basis for developing scientific independence and a hands-on attitude.

This thesis would not have been possible without my collaborators Yevheniia Cheipesh, Nikolay V. Gnezdilov, and Andrei I. Pavlov with whom I worked together on each topic covered in this thesis. We formed a group with diverse research backgrounds and interests, making everything more dynamic and interesting. I have enjoyed every moment we have worked together, our discussions and enthusiasm-driven debates. I deeply appreciate your contributions for I have learned so much from you all.

In the last year of my Ph.D. I re-connected with my mentor from the bachelor studies Irina Petreska, and, together with Trifce Sandev, we started working on mixing classical stochasticity and unitary evolution of quantum systems. Thank you for introducing me to this field, it came at a time when I was looking for new challenges and has been a source of inspiration ever since. In the same year, while learning and navigating stochastic waters, I met Benjamin Walter and each day of discussing or working together has been a delightful experience. My Ph.D. journey would have been even better if we had met at the last conference before the pandemic, rather than the first after, but I am glad our paths crossed. I am looking forward to working on all our envisioned projects.

Those years at Leiden would not have been enjoyable without my colleagues and friends Aleksandar Bukva, Floris Balm, Nicolas Chagnet, and Aravindh Shankar. With Aleksandar, we had conversations on everything from physics, and coding to cooking recipes as well as a shared interest in F1 and cycling. With Nicolas and Aravindh I could not only discuss some of our most tantalizing work problems but also have leisurely walks, deep-diving into the meaning of life, or simply a relaxing chit-chat. And then, I could not have wished for a better office mate than Floris. Our shared passion for natural sciences, politics, and the financial system

was a refreshing breeze during the heat storms of physics. Unfortunately, our office life was interrupted by the pandemic, but I am happy we are office-mates all over again for you have been my mentor and guide on Dutch society and there is still so much more I need to learn. Here, I want to thank NWO for funding my thesis, Leiden University for hosting me, the secretariat of the Lorentz Institute, and LION for all the help over the years. Also, I would like to thank the staff at the ALICE High-Performance Computing facility for allowing me to conduct most of the numerical studies.

Next, I want to express my gratitude to the professors from my undergraduate studies, especially Irina, Mimoza, Aleksandar, Lambe, and Danica. Thank you for always supporting me and providing me with a firm foundation which later made everything much easier. Besides receiving a good education, I found a kindred spirit there, my invaluable friend Enes, and I am so happy to have met you. I also want to thank Ludwik Dobrzynski first for coming to Macedonia and giving a lecture on the monumental efforts for building and running the LHC, then for supporting my dreams to go to CERN, introducing me to the joint HEP master program, and for being a true friend, especially during some of my most trying days in Paris.

I am extremely grateful to my parents, for supporting me throughout my education in Macedonia, and mostly for devoting their lives so that I and my brother could have a carefree childhood. This helped me stay focused and committed to studying and paving the road to where I am today. I want to thank my brother especially for unselfishly sharing pictures of my niece, a little bundle of joy that has always brought a smile to my face. While at family, I want to thank Vinzenz, who has been not only my best friend but also an international sibling. You have been around me not only to share the joy but to also lift me from the lowest points of my 8-year journey abroad. Thank you for believing in our friendship and never giving up on me.

In the end, all that has been achieved here is thanks to my love and steadfast companion Renata. Your love and unwavering support have been my anchor throughout this journey. You have been my sunshine through the gloomy Dutch days and a spring of joy even during the most difficult periods. There are no words to express how grateful I am to have you. Thank you for being on my side through all those years and founding our home in the Netherlands. Our journey, a mosaic of memories across diverse lands, now finds us side by side in this sunlit train carriage, the fields blurring past. I am filled with an exhilarating anticipation for the unwritten chapters of our shared future, a future as boundless and luminous as the love that binds us.

### Curriculum Vitae

I was born, on  $20^{\rm th}$  June 1991, and raised in Prilep, Republic of Macedonia. I had my secondary education at the local gymnasium "Mirče Acev" where I developed an interest in natural sciences.

After considering the idea of continuing my higher education in genetics and virology for a while, I decided to enroll in theoretical physics at the Ss. Cyril and Methodius University in Skopje, a decision I've enjoyed ever since. During my bachelor's studies, I worked on developing a Schlieren imaging setup, applications of the Hubbard model, and charge transport in molecular rotors. I also explored topics in strongly interacting electronic systems, for which in 2012 I attended a workshop at ICTP in Trieste, Italy, and later in particle physics which in 2013 led to my first international internship at CERN where I worked on an analysis of proton-proton collision data at the ALICE collaboration. Inspired by this internship, and my growing interest in the field, I decided to pursue a Master's degree in High-Energy Physics (HEP).

For this endeavor, I chose the joint program between École Polytechnique and ETH Zürich. During the first year, at École Polytechnique, I studied the foundations of theoretical and experimental HEP concluding it with a thesis on "Measurement of the Higgs boson width" in the CMS collaboration. For the second year of the master's program I moved to ETH Zürich where I focused on integrable systems, CFTs, holography, and string theory and graduated with a thesis on "Bootstrapping of meromorphic conformal field theories". During a gap year, after obtaining my Master's degree, I continued working on holographic theories and then took an internship at the Institute for Particle Physics and Astrophysics at ETH Zürich, where I worked on the observation of Higgs boson decay to bottom quarks with the CMS experiment at CERN.

Subsequently, I pursued my Ph.D. at Leiden University in the "Scanning New Horizons: Emergent Space-Time, Black Holes and Quantum Information" program. My research encompassed the thermalization of quantum systems, quantum information, transport in SYK chains, and holographic superconductors. Toward the end of my Ph.D., I became interested in the dynamics of quantum systems under stochastic resetting, leading to a research visit at SISSA in Trieste, Italy. Scientific results from my time at Leiden University have been presented at many national and international conferences.

## List of Publications

- Floris Balm, Nicolas Chagnet, Sam Arend, Joost Aretz, Kevin Grosvenor, Martijn Janse, Ole Moors, Jonah Post, Vladimir Ohanesjan, David Rodriguez-Fernandez, Koenraad Schalm, Jan Zaanen, *T-linear resistivity, optical conductivity and Planckian transport for a holographic local quantum critical metal in a periodic potential*, Phys.Rev.B 108 (2023) 125145 [arXiv:2211.05492].
- V. Ohanesjan, Y. Cheipesh, N. V. Gnezdilov, A. I. Pavlov, K. Schalm, Energy dynamics, information and heat flow in quenched cooling and the crossover from quantum to classical thermodynamics, JHEP 05 (2023) 237 [arXiv:2204.12411].
- N. V. Gnezdilov, A. I. Pavlov, V. Ohanesjan, Y. Cheipesh, K. Schalm, *Ultrafast dynamics of cold Fermi gas after a local quench*, Phys. Rev. A 107, L031301 (2023) [arXiv:2108.12031].
- Y. Cheipesh, A. I. Pavlov, V. Ohanesjan, K. Schalm, N. V. Gnezdilov, Quantum tunneling dynamics in a complex-valued Sachdev-Ye-Kitaev model quench-coupled to a cool bath, Phys. Rev. B 104, 115134 (2021) [arXiv:2011.05238].
- Irina Petreska, Vladimir Ohanesjan, Ljupco Pejov, Ljupco Kocarev, Tunneling of electrons via rotor-stator molecular interfaces: combined ab initio and model study, Chem. Phys., 473 (2016) p. 32 [arXiv:1509.00848]