



TO MAGNIFICO RETTORE OF UNIVERSITA' DEGLI STUDI DI MILANO

ID CODE \_\_\_\_\_6322\_\_\_\_\_

I the undersigned asks to participate in the public selection, for qualifications and examinations, for the awarding of a type B fellowship at **Dipartimento di \_Fisica Aldo Pontremoli\_\_\_\_\_**

Scientist- in - charge: \_\_\_\_\_ **Prof. Genoni Marco Giovanni** \_\_\_\_\_

[Name and surname]

## CURRICULUM VITAE

### PERSONAL INFORMATION

Surname	O'Connor
Name	Eoin

### PRESENT OCCUPATION

Appointment	Structure
Postdoctoral Researcher	University College Dublin

### EDUCATION AND TRAINING

Degree	Course of studies	University	year of achievement of the degree
Degree	Theoretical Physics	Trinity College Dublin	2019
PhD	Theoretical Physics	University College Dublin	2023

### FOREIGN LANGUAGES

Languages	level of knowledge
English	Fluent

### AWARDS, ACKNOWLEDGEMENTS, SCHOLARSHIPS

Year	Description of award
2019	Gold Medal from Trinity College Dublin



## TRAINING OR RESEARCH ACTIVITY

Throughout my PhD I developed tools to characterise and optimise the dynamics of open quantum systems. In my first project I highlighted some of the problems with the interpretation of quantum speed limits in the literature. I used this insight to derive a new family of quantum speed limit bounds that are more physically motivated. I then demonstrated that these bounds can be saturated naturally by applying optimal control protocols such as “Pontryagin’s optimum principle”.

I investigated the effects that correlations play on parameter estimation in sequentially measured quantum systems. I proved that for there to be any advantage from these correlations some information about the unknown parameter must be contained in the system environment interaction. I showed that collisional metrology can be thought of as a generalisation of a sequential measurement process. I established that the addition of randomness to such a collisional metrology setup results in a significant expansion of the parameter range over which an advantage can be gained over standard probe-based thermometry.

Finally I employed a novel approach of using the entropy of the quantum work distribution to capture signatures of the underlying physics in a number of models. In particular, in this project we analysed the Aubrey-André-Harper model and found that the entropy of the work distribution underwent a sharp jump at the localisation transition.

Collectively, these results provide a toolbox to assess the optimality, either in terms of the dynamical paths taken, utility for metrological tasks, or ability to spotlight relevant physical properties of the model, for the dynamics of complex quantum systems.

## CONGRESSES AND SEMINARS

Date	Title	Place
Nov 2020	Condensed Matter Theory Group seminar	University College Dublin, Dublin, Ireland
Feb 2021	Invited seminar to group of Sebastian Deffner, UMBC	Online
Mar 2021	APS March, presentation	Online
Mar 2021	Lake Como School, presentation	Online
Jun 2021	Symposium on Mathematical Physics	Online
Jul 2021	TiQuR, presentation	Online
Oct 2021	Quantum Thermodynamics Conference, presentation	Online
Nov 2021	Quantum Backstop, presentation	Dundalk, Ireland
May 2022	Quantum Thermodynamics Conference, poster	Online
May 2022	Irish Theoretical Physics	DIAS, Dublin, Ireland
Oct 2022	Research visit to group of Prof. Gabriel Landi - invited seminar	University of São Paulo, São Paulo

## PUBLICATIONS

Articles in reviews
“Action quantum speed limits”, E. O’Connor, G. Guarnieri, S. Campbell, Physical Review A 103, 022210 , APS, 2021



“Stochastic Collisional Quantum Thermometry”, E. O’Connor, B. Vacchini, S. Campbell, Entropy 23, 1634, MDPI 2021
“Entropy of the quantum work distribution”, A. Kiely, E. O’Connor, T. Fogarty, G.T. Landi, and S. Campbell, Physical Review Research 5, L022010, APS 2023
“Fisher information rates in sequentially measured quantum systems”, E. O’Connor, G.T. Landi, and S. Campbell, arXiv, 2401.06543, 2024

Teaching and Supervision

Date	Description	Place
Sept-Dec 2020	Lab Demonstrator, First year physics labs	University College Dublin, Dublin, Ireland
Sept 2023 - Present	Undergraduate student supervision, co-supervision of final year project	University College Dublin, Dublin, Ireland

OTHER INFORMATION

Attended school on “Quantum Information Theory and Thermodynamics at the Nanoscale” in Feb 2020 in Al Hoceima, Morocco
Attended Lake Como School on “Thermodynamics of quantum systems and processes” in March 2021 online

Declarations given in the present curriculum must be considered released according to art. 46 and 47 of DPR n. 445/2000.

The present curriculum does not contain confidential and legal information according to art. 4, paragraph 1, points d) and e) of D.Lgs. 30.06.2003 n. 196.

Please note that CV WILL BE PUBLISHED on the University website and It is recommended that personal and sensitive data should not be included. This template is realized to satisfy the need of publication without personal and sensitive data.

Please DO NOT SIGN this form.

Place and date: \_\_\_\_Dublin\_\_\_\_\_, \_\_\_\_02/02/2024\_\_\_\_