Simon Milz – Curriculum Vitae

Date of Birth   May 23, 1987
Nationality   German
Languages   German (native), English (fluent),
French (proficient)
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Heriot-Watt University
Edinburgh
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Professional Experience

02/2025 – present	**Assistant Professor**
	Theoretical Quantum Information
	Institute of Photonics and Quantum Sciences (IPAQS)
	Heriot-Watt University Edinburgh
04/2023 – 02/2025	**Marie-Skłodowska-Curie (MSCA) Postdoctoral Fellow**
	Quantum Information Theory Group
	School of Physics
	Trinity College Dublin
10/2022 – 04/2023	**Co-Group Leader**
	Young Independent Research Group (YIRG)
	School of Physics
	University of Vienna
03/2022 – 04/2023	**Senior Postdoctoral Fellow**
	Young Independent Research Group (YIRG)
	Institute for Quantum Optics and Quantum Information (IQOQI) Vienna,
	Austrian Academy of Sciences
12/2019 – 03/2022	**Postdoctoral Fellow/ ESQ Fellow**
	Huber Group
	Institute for Quantum Optics and Quantum Information (IQOQI) Vienna
	Austrian Academy of Sciences
05/2019 – 12/2019	**Postdoctoral Fellow**
	YIRG (Young Independent Research Group)
	Institute for Quantum Optics and Quantum Information (IQOQI) Vienna
	Austrian Academy of Sciences

Education

11/2015 – 04/2019	**PhD** in Quantum Information Theory
	Quantum Information Science Group
	Monash University, Melbourne, Australia.
	Thesis: On the Operational Theory of General (Quantum) Stochastic Processes
	Supervisors: Kavan Modi and Felix A. Pollock
	Examiners: Howard M. Wiseman and Paolo Perinotti
06/2018 – 09/2018	**Research Visit**.
	Department of Computer Science
	University of Oxford, UK
	Topic: Resource Theory of Causal Connection
	Collaboration with Giulio Chiribella
04/2011 – 08/2011	**Internship** at the Institute of Theoretical Physics
	Université Aix-Marseille II, France.
	Topic: Pseudo-Anosov homeomorphisms in hyperelliptic components
	Supervisor: Erwan Lanneau

06/2010 – 09/2011	**Study exchange**. Université Aix-Marseille II, France. Masters programme for Mathematical and Theoretical Physics
10/2007 – 04/2014	**Diplom in Physics*** (GPA: 1.1/1.0)**. Theoretical Quantum Optics Group TU Dresden, Germany THESIS: Correlations and their Influence on the Dynamics of Open Qubit Systems. SUPERVISOR: Walter T. Strunz (*Equivalent to a MSc in Physics) (** German academic grades range from 1.0 to 5.0, with 1.0 being best.)

FELLOWSHIPS AND AWARDS

04/2023 – PRESENT	**Marie Skłodowska-Curie (MSCA) Postdoctoral Fellowship** ($\sim$ 200k EUR) Trinity College Dublin, Ireland
2019 – 2021	**ESQ Fellowship** ($\sim$ 120k EUR) Erwin Schrödinger Center for Quantum Science & Technology (ESQ), Austria
2019	**Monash Postgraduate Publication Award** ($\sim$3.2k EUR) Funding for high-achieving PhD students for preparation and publication of research results after graduation
2015 – 2019	**J. L. William Postgraduate Scholarship** ($\sim$ 9.4k EUR), Top-up Scholarship offered by the School of Physics and Astronomy, Monash University, Melbourne
2015 – 2019	**Monash Graduate Scholarship** (MGS) ($\sim$ 63k EUR) Stipend and Tuition Scholarship for students undertaking Research Doctorate degrees
2010 – 2014	**Studienstiftung des Deutschen Volkes** (German Academic Scholarship Foundation), Scholarship foundation funded by the German government for the support of academically exceptional students

EXTERNAL FUNDING

2019 – 2021	**Foundational Questions Institute** (FQXi), Large Grant ($\sim$ 68k EUR), TITLE: Predictive Quantum Intelligence under Physical Constraints
2018 – 2020	**Australia-Germany joint Research co-operation scheme**, ($\sim$ 26k EUR) Travel grant by the German Academic Exchange Service (DAAD) Awarded to instigate collaboration between the Theoretical Quantum Optics Group at the University Siegen, Germany, and the Quantum Information Science Group at Monash University, Australia TITLE: Genuinely quantum stochastic processes

SUPERVISION AND MENTORING ACTIVITIES

07/2024 – present	**PhD co-supervision** of Yutong Luo Trinity College Dublin PROJECT TITLE: Athermality, memory, and the arrow of time in quantum mechanics.
09/2023 – 07/2024	**MSc co-supervision** of Yutong Luo Trinity College Dublin PROJECT TITLE: The role of memory in the resource theory of athermality

2023	**Capstone project (9 weeks) co-supervision** of Minfei Zou and Dubhaltach McSweeny Trinity College Dublin Project titles: Efficient approximations to stochastic process models & Petz recovery of multi-time processes
2020 – 2022	**PhD co-supervision** of Philip Taranto University of Vienna Thesis: Quantum Information Processing: Thermodynamics, Complexity, and Multi-Time Phenomena
2020 – 2021	**MSc co-supervision** of Felix Hubmann University of Vienna Project title: Thermal operations with memory
Since 2020	**Thesis advisory committee** (TAC) mentor of Joshua Morris University of Vienna
2018 – 2019	**MSc co-supervision** of Philip Taranto Monash University Thesis: An Introduction to Memory Effects in Quantum Processes
2018	**Honours co-supervision** of Dominic Jurkschat Monash University Thesis: Causality in Quantum Processes.

Teaching activities

Since 01/2024	**Co-Lecturer** on graduate course Selected Topics in Quantum Information Theory Coordination, Design and Teaching Trinity College Dublin
10/2020 – 04/2021	**Co-Lecturer** on graduate course Entanglement Theory Coordination, Design, Teaching, and Marking University of Vienna
11/2015 – 01/2019	**Tutorial classes** on Quantum Mechanics, Thermodynamics, and Electrodynamics Preparation and delivery of tutorials for undergraduate students School of Physics & Astronomy, Monash University, Melbourne, Australia
2011 – 2013	**Student research assistant** Theoretical Quantum Optics Group, TU Dresden, Germany. Preparation of exercise and solution sheets for student tutorials
2008 – 2010	**Tutorial classes on Analysis** Institute for Analysis, TU Dresden, Germany. Preparation and delivery of tutorials for undergraduates

Reviewing activities and academic citizenship

Scientific referee for:
- Nature Communications
- Physical Review X
- Physical Review Letters
- Physical Review A
- npj Quantum Information
- Quantum
- New Journal of Physics

Organizer of the Physics Colloquium at Monash University (2016-2018)

Publications

Peer-reviewed in International Journals

1. CHARACTERISING THE HIERARCHY OF MULTI-TIME QUANTUM PROCESSES WITH CLASSICAL MEMORY
   P. Taranto, M. T. Quintino, M. Murao, and <u>SM</u>
   Quantum **8,** 1328 (2024).

2. TRANSFORMATIONS BETWEEN ARBITRARY (QUANTUM) OBJECTS AND THE EMERGENCE OF INDEFINITE CAUSALITY
   <u>SM</u> and M. T. Quintino
   Quantum **8,** 1328 (2024).

3. WITNESSING ENVIRONMENT DIMENSION THROUGH TEMPORAL CORRELATIONS
   L. B. Vieira, <u>SM</u>, G. Vitagliano, and C. Budroni
   Quantum **8,** 1224 (2024).

4. HIDDEN QUANTUM MEMORY: IS MEMORY THERE WHEN SOMEBODY LOOKS?
   P. Taranto, Thomas J. Elliott, and <u>SM</u>
   Quantum **7,** 991 (2023).

5. EXTRACTING QUANTUM DYNAMICAL RESOURCES: CONSUMPTION OF NON-MARKOVIANITY FOR NOISE REDUCTION
   G. D. Berk, <u>SM</u>, F. A. Pollock, and K. Modi
   npj Quantum Inf **9,** 104 (2023).

6. RESOURCE THEORY OF CAUSAL CONNECTION
   <u>SM</u>, J. Bavaresco, and G. Chiribella
   Quantum **6,** 788 (2022).

7. CONNECTING COMMUTATIVITY AND CLASSICALITY FOR MULTI-TIME QUANTUM PROCESSES
   F. Sakuldee, P. Taranto, and <u>SM</u>
   Phys. Rev. A **106,** 022416 (2022).

8. *Quantum stochastic processes and quantum non-Markovian phenomena*
   <u>SM</u> and K.Modi,
   PRX Quantum **2,** 030201 (2021).

9. GENUINE MULTIPARTITE ENTANGLEMENT IN TIME
   <u>SM</u>, C. Spee, Z.-P. Xu, F. A. Pollock, K. Modi, and O. Gühne,
   SciPost Phys. 10, 141 (2021).

10. DELAYED-CHOICE CAUSAL ORDER AND NONCLASSICAL CORRELATIONS
    <u>SM</u>, D. Jurkschat, F. A. Pollock, and K. Modi,
    Phys. Rev. Research **3,** 023028 (2021).

11. WHEN IS A NON-MARKOVIAN QUANTUM PROCESS CLASSICAL?
    <u>SM</u>, D. Egloff, P. Taranto, T. Theurer, M. B. Plenio, A. Smirne, and S. F. Huelga,
    Phys. Rev. X **10,** 041049 (2020).

12. KOLMOGOROV EXTENSION THEOREM FOR (QUANTUM) CAUSAL MODELLING AND GENERAL PROBABILISTIC THEORIES
    <u>SM</u>, F. Sakuldee, F. A. Pollock, and K. Modi,
    Quantum 4, 255 (2020).

13. COMPLETELY POSITIVE DIVISIBILITY DOES NOT MEAN MARKOVIANITY
    <u>SM</u>, M. S. Kim, F. A. Pollock, and K. Modi,
    Phys. Rev. Lett. **123,** 040401 (2019).

14. QUANTUM MARKOV ORDER
    P. Taranto, F. A. Pollock, <u>SM</u>, M. Tomamichel, and K. Modi,
    Phys. Rev. Lett. **122,** 140401 (2019).

15. STRUCTURE OF QUANTUM STOCHASTIC PROCESSES WITH FINITE MARKOV ORDER
    P. Taranto, <u>SM</u>, F. A. Pollock, and K. Modi,
    Phys. Rev. A **99,** 042108 (2019).

16. RECONSTRUCTING OPEN QUANTUM SYSTEM DYNAMICS WITH LIMITED CONTROL
    <u>SM</u>, F. A. Pollock, and K. Modi,
    Phys. Rev. A, *98,* 012108 (2018).

17. Non-Markovian quantum control as coherent stochastic trajectories
F. Sakuldee, <u>SM</u>, F. A. Pollock, and K. Modi,
J. Phys. A: Math. Theor. **51**, 414014 (2018).

18. Entanglement, non-Markovianity, and causal non-separability
<u>SM</u>, F. A. Pollock, T. P. Le, G. Chiribella, and K. Modi,
New J. Phys. **20**, 033033 (2018).

19. An Introduction to Operational Quantum Dynamics
<u>SM</u>, F. A. Pollock, and K. Modi,
Open Syst. Inf. Dyn. **24**, 1740016 (2017).

20. Volumes of conditioned bipartite state spaces
<u>SM</u> and W. T. Strunz
J. Phys. A: Math. Theor. **48**, 035306 (2014).

Pre-Prints

1. Higher-Order Quantum Operations
P. Taranto, <u>SM</u>, M. Murao, M. T. Quintino, and K. Modi
arXiv:2503.09693 (2025).

2. Monotones in Resource Theories for Dynamical Decoupling
G. D. Berk, <u>SM</u>, and K. Modi
arXiv:2412.11595 (2024).