

# Curriculum Vitæ — Ämin Baumeler

Faculty of Informatics  
Università della Svizzera italiana  
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Switzerland

## Personal information

Name	Dr. Ämin Baumeler
OrcID	0000-0001-6760-0439
Google Scholar ID	<a href="#">pDbYln4AAAAJ</a>
Research interests	Foundations of quantum theory, quantum information, quantum computing, relativistic causality, computational and algorithmic complexity theory, cryptography
Languages	German, English, French
Nationality	Swiss

## Education

11-2012 – 3-2017	<b>PhD in Informatics</b> Faculty of Informatics, Università della Svizzera italiana (USI), Lugano, Switzerland Supervisor: Prof. Stefan Wolf Thesis Title: <i>Causal loops: logically consistent correlations, time travel, and computation</i> Date of Defense: 30 March 2017 Dissertation Committee: Prof. Āaslav Brukner, Prof. Antonio Carzaniga, Prof. Robert Soulé, Prof. William K. Wootters URN: <a href="#">urn:nbn:ch:rero-006-116046</a> For this thesis, I was awarded the <b>GI best-thesis award</b> (see <a href="#">Awards and fellowships</a> )
3-2012 – 8-2012	<b>Master's thesis</b> Institute for Quantum Computing, University of Waterloo, Waterloo, Canada Supervisors: Prof. Anne Broadbent and Prof. Ueli Maurer Thesis Title: <i>Quantum private information retrieval</i> doi: <a href="#">10.3929/ethz-a-007580626</a>
9-2006 – 10-2012	<b>B.Sc. ETH and M.Sc. ETH in Computer Science</b> , ETH Zürich, Zürich, Switzerland

## Employment history

since 4-2023	<b>Research associate</b> USI, Lugano, Switzerland
4-2019 – 3-2023	<b>Group leader</b> of the <i>Young Independent Researcher Group (YIRG)</i> Institute for Quantum Optics and Quantum Information (IQOQI-Vienna) Austrian Academy of Sciences, Vienna, Austria
9-2017 – 3-2019	<b>Post-doctoral researcher</b> in the group of Prof. Āaslav Brukner IQOQI-Vienna, Austrian Academy of Sciences, Vienna, Austria
2009 – 2012	<b>Backend developer and security consultant</b> , VPNSwiss, Aixos GmbH and Suissl AG, Switzerland
2009 – 2010	<b>Internship</b> as security consultant and security auditor, terreActive AG, Aarau, Switzerland

## Research projects

- 4-2019 – 3-2023 | PI of the [Zukunftskolleg](#) “Emergence of Causal Order in Quantum Theory and Beyond” Austrian Science Fund (approx. 1.8 Mio EUR)
- since 3-2019 | Co-PI of the [Special Research Program \(SFB\)](#) “BeyondC,” Austrian Science Fund (approx. 5.3 Mio EUR for the first, and 6.4 Mio EUR for the second phase starting 2023)

## Awards and fellowships

- 3-2019 – 4-2020 | [Erwin Schrödinger Center for Quantum Science and Technology Fellowship](#) Austrian Academy of Sciences
- 9-2017 – 2-2019 | [Early Postdoc.Mobility Fellowship](#), Swiss National Science Foundation
- 9-2018 | [GI-Dissertationspreis 2017](#), best-thesis award  
German, Swiss, and Austrian societies of computer science
- 12-2016 | [NJP Outstanding Reviewer Award](#), New Journal of Physics (DPG, IOP)

## Supervision

- 10-2020 – 9-2024 | Supervision of PhD student Eleftherios-Ermis Tselentis  
IQOQI-Vienna, Vienna, Austria  
Thesis title: *Causality and computation in dynamical spacetime*
- 3-2020 – 6-2020 | Supervision of the internship student Eleftherios-Ermis Tselentis  
Physics, ETH Zürich, Zürich, Switzerland
- 2-2020 – 6-2020 | Supervision of the internship student Amin Shiraz Gilani  
Computer Science, Habib University, Karachi, Pakistan
- 11-2016 – 3-2017 | Supervision of Master’s student: Daniel Keller  
Computer Science, ETH Zürich, Zürich, Switzerland  
Thesis title: *On the fixed points of quantum operations*
- 4-2015 – 10-2015 | Supervision of Master’s student: Vitor Bosshard  
Computer Science, ETH Zürich, Zürich, Switzerland  
Thesis title: *Classical and quantum algorithms for USO recognition*

## Teaching activities

- 5-2022 | *Quantum Information and Foundations*, Mini-lecture, School of Applied Mathematics and Physical Science, National Technical University of Athens, Greece
- 10-2021 | *Introduction to Computation*, YIRG-workshop, IQOQI-Vienna
- 7-2019 | *Causality and Computation*, Quantum Information Summer School 2019  
IBA, Karachi, Pakistan
- 3-2019 | *Introduction to Quantum Computing*, 1<sup>st</sup> VDS Winter School on Quantum Computation  
Vienna Doctoral School “Mathematics,” University of Vienna, Austria
- 2-2016 | Course on *Quantum Cryptography and Foundations of Quantum Theory*, 15<sup>th</sup> Bellairs  
Cypto-Workshop, Bellairs Research Institute of McGill University, St. James, Barbados
- 2-2013 – 6-2016 | Teaching assistant in *Quantum Computing*

	USI, Lugano, and, ETH Zürich, Zürich, Switzerland
2-2013 – 6-2016	Teaching assistant in <i>Quantum Information &amp; Cryptography</i> (seminar) USI, Lugano, and ETH Zürich, Zürich, Switzerland
2-2013 – 6-2016	Teaching assistant in <i>Discrete Mathematics</i> , USI, Lugano, Switzerland
3-2009 – 6-2009	Teaching assistant in <i>Computer Networks</i> , ETH Zürich, Zürich, Switzerland
9-2008 – 12-2008	Teaching assistant in <i>Systems Programming and Computer Architecture</i> ETH Zürich, Zürich, Switzerland

## Memberships and reviewing activities

2025	Program Committee Member, <a href="#">22nd International Conference on Quantum Physics and Logic (QPL 2025)</a>
11-2022	PhD Jury Member, Imperial College London, UK
1-2022	External reviewer for the National Science Center, Poland
1-2022	PhD Jury Member, Instituto Superior Técnico, University of Lisbon, Portugal
2021 – 2022	Selection Committee Member, Paul Ehrenfest Best Paper Award for Quantum Foundations, IQOQI-Vienna, Austria
since 2015	Article reviewer at APS, Springer, Nature, IEEE, and other publishers

## Active memberships in scientific societies

since 4-2021	Member of Critical Scientists Switzerland
since 10-2019	Member of “Physics meets Philosophy in Vienna” Institut Wiener Kreis and Faculty of Physics, University of Vienna, Austria

## Institutional responsibilities

6-2021 – 4-2023	Mentor at the Vienna Doctoral School in Physics, University of Vienna, Austria
2021 – 2022	Organizer of the Paul Ehrenfest Best Paper Award For Quantum Foundations IQOQI-Vienna, Austria

## Organization of conferences

3-2020	Organization of workshop <i>The Order of Things</i> Universitätszentrum Obergurgl, University of Innsbruck, Obergurgl, Austria <i>Cancelled due to the Covid-19 outbreak</i>
2-2017	Organization of the <i>Gandria Workshop on Natural Philosophy, Part 2</i> Gandria, Switzerland
12-2016	Organization of the <i>Gandria Workshop on Natural Philosophy</i> Gandria, Switzerland
9-2016	Organization of the academy <i>Die moralisch-ethische Frage in Wissenschaft und Technik</i> Swiss Study Foundation, Magliaso, Switzerland with Prof. Emer. Jürg Fröhlich and Prof. Stefan Wolf

5-2015 | Organization of the *8<sup>th</sup> International Conference on Information-Theoretic Security*  
Università della Svizzera italiana (USI), Lugano, Switzerland  
with Dr. Anja Lehmann and Prof. Stefan Wolf

Almost all outputs were published with an alphabetically ordered authors list. The five most-important research outputs are highlighted with a star (★).

### Publications in peer-reviewed scientific journals

- ★ 10-2023 | Eleftherios-Ermis Tselentis, and Ämin Baumeler, *Admissible Causal Structures and Correlations*, Physical Review X Quantum 4, 040307, doi:[10.1103/PRXQuantum.4.040307](https://doi.org/10.1103/PRXQuantum.4.040307)
- 9-2023 | Ravi Kunjwal, and Ämin Baumeler, *Trading causal order for locality*, Physical Review Letters 131:120201, doi:[10.1103/PhysRevLett.131.120201](https://doi.org/10.1103/PhysRevLett.131.120201)
- 3-2022 | Ämin Baumeler, Amin Shiraz Gilani, and Jibrán Rashid, *Unlimited non-causal correlations and their relation to non-locality*, Quantum 6:673, doi:[10.22331/q-2022-03-29-673](https://doi.org/10.22331/q-2022-03-29-673)
- ★ 11-2019 | Ämin Baumeler, and Stefan Wolf, *Free energy of a general computation*, Physical Review E 100:052115, doi:[10.1103/PhysRevE.100.052115](https://doi.org/10.1103/PhysRevE.100.052115)
- 11-2019 | Francesco Massa, Amir Moqanaki, Ämin Baumeler, Flavio Del Santo, Joshua A. Kettlewell, Borivoje Dakić, and Philip Walther, *Experimental two-way communication with one photon*, Advanced Quantum Technologies 2:1900050, doi:[10.1002/qute.201900050](https://doi.org/10.1002/qute.201900050)
- ★ 10-2019 | Ämin Baumeler, Fabio Costa, Timothy Ralph, Stefan Wolf, and Magdalena Zych, *Reversible time travel with freedom of choice*, Classical and Quantum Gravity 36:224002, doi:[10.1088/1361-6382/ab4973](https://doi.org/10.1088/1361-6382/ab4973)
- 7-2019 | Ämin Baumeler, *Causal loops: Logically consistent correlations, time travel, and computation*, Information Technology 61:135, doi:[10.1515/itit-2019-0005](https://doi.org/10.1515/itit-2019-0005)
- 1-2018 | Ämin Baumeler, and Stefan Wolf, *Computational tameness of classical non-causal models*, Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences 474:20170698, doi:[10.1098/rspa.2017.0698](https://doi.org/10.1098/rspa.2017.0698)
- 11-2017 | Mateus Araújo, Philippe Allard Guérin, and Ämin Baumeler, *Quantum computation with indefinite causal structures*, Physical Review A 96:052315, doi:[10.1103/PhysRevA.96.052315](https://doi.org/10.1103/PhysRevA.96.052315)
- 7-2017 | Ämin Baumeler, and Stefan Wolf, *Non-causal computation*, Entropy 19:326, doi:[10.3390/e19070326](https://doi.org/10.3390/e19070326)
- 4-2016 | Ämin Baumeler, and Stefan Wolf, *Device-independent test of causal order and relations to fixed-points*, New Journal of Physics 18:035014, doi:[10.1088/1367-2630/18/3/035014](https://doi.org/10.1088/1367-2630/18/3/035014)
- ★ 1-2016 | Ämin Baumeler, and Stefan Wolf, *The space of logically consistent classical processes without causal order*, New Journal of Physics 18:013036, doi:[10.1088/1367-2630/18/1/013036](https://doi.org/10.1088/1367-2630/18/1/013036)
- 1-2015 | Ämin Baumeler, and Anne Broadbent, *Quantum private information retrieval has linear communication complexity*, Journal of Cryptology 28:161, doi:[10.1007/s00145-014-9180-2](https://doi.org/10.1007/s00145-014-9180-2)
- 10-2014 | Ämin Baumeler, Adrien Feix, and Stefan Wolf, *Maximal incompatibility of locally classical behavior and global causal order in multiparty scenarios*, Physical Review A 90:042106, doi:[10.1103/PhysRevA.90.042106](https://doi.org/10.1103/PhysRevA.90.042106)

## Peer-reviewed books/monographs

- 3-2017 | *Causal loops: logically consistent correlations, time travel, and computation*, PhD thesis, Università della Svizzera italiana, Lugano, Switzerland, URN: [urn:nbn:ch:rero-006-116046](https://nbn-resolving.org/urn:nbn:ch:rero-006-116046)  
For my PhD thesis I was awarded the best-thesis award of the German, Swiss, and Austrian societies of computer science.
- 8-2012 | *Quantum private information retrieval*, Master's thesis, Institute for Quantum Computing, University of Waterloo, Canada, and Departement of Computer Science, ETH Zürich, Zürich, Switzerland, doi:[10.3929/ethz-a-007580626](https://doi.org/10.3929/ethz-a-007580626)

## Peer-reviewed conference proceedings

- 11-2022 | Ämin Baumeler, Carla Rieger, and Stefan Wolf, *Thermodynamics as Combinatorics: A Toy Theory*, in Proceedings of the IEEE Information Theory Workshop (ITW), 1 – 9 November 2022, pp. 362-367, doi:[10.1109/ITW54588.2022.9965927](https://doi.org/10.1109/ITW54588.2022.9965927)
- 9-2021 | Ämin Baumeler, and Eleftherios Tselentis, *Equivalence of grandfather and information antinomy under intervention*, Proceedings of the 17th International Conference on Quantum Physics and Logic (QPL2020), Electronic Proceedings in Theoretical Computer Science 340, doi:[10.4204/EPTCS.340.1](https://doi.org/10.4204/EPTCS.340.1)
- 8-2017 | Ämin Baumeler, Charles Alexandre Bédard, Gilles Brassard, and Stefan Wolf, *Kolmogorov amplification from Bell correlations*, in Proceedings of the IEEE International Symposium on Information Theory (ISIT), 25 June – 30 June 2017, pp. 1554–1558, doi:[10.1109/ISIT.2017.8006790](https://doi.org/10.1109/ISIT.2017.8006790)
- 6-2014 | Ämin Baumeler, and Stefan Wolf, *Perfect signaling among three parties violating predefined causal order*, in Proceedings of the IEEE International Symposium on Information Theory (ISIT), 29 June – 4 July 2014, pp. 526–530, doi:[10.1109/ISIT.2014.6874888](https://doi.org/10.1109/ISIT.2014.6874888)

## Peer-reviewed contributions to books

- 1-2019 | Ämin Baumeler, *Causal loops: Logically consistent correlations, time travel, and computation*, in S. Hölldobler (ed.) *Ausgezeichnete Informatikdissertationen 2017*, Gesellschaft für Informatik e.V., Bonn, <https://dl.gi.de/handle/20.500.12116/19458>
- 6-2018 | Ämin Baumeler, Julien Degorre, and Stefan Wolf, *Bell correlations and the common future*, in A. Khrennikov, B. Toni (eds.) *Quantum Foundations, Probability and Information*, Springer International Publishing, Cham, doi:[10.1007/978-3-319-74971-6\\_18](https://doi.org/10.1007/978-3-319-74971-6_18)
- 9-2017 | Ämin Baumeler, and Stefan Wolf, *Causality—Complexity—Consistency: Can space-time be based on logic and computation?*, in R. Renner, S. Stupar (eds.) *Time in Physics*, Birkhäuser, Cham, doi:[10.1007/978-3-319-68655-4\\_6](https://doi.org/10.1007/978-3-319-68655-4_6)

## Preprints

- 11-2024 | Jessica Bavaresco, Ämin Baumeler, Yelena Guryanova, and Costantino Budroni, *Indefinite causal order in boxworld theories*, [arXiv:2411.00951](https://arxiv.org/abs/2411.00951) [[quant-ph](https://arxiv.org/archive/quant)]
- 10-2024 | Ämin Baumeler, and Stefan Wolf, *Flow of dynamical causal structures with an application to correlations*, [arXiv:2410.18735](https://arxiv.org/abs/2410.18735) [[quant-ph](https://arxiv.org/archive/quant)], under consideration at Physical Review Letters

- ★ 7-2024 | Eleftherios-Ermis Tselentis, and Ämin Baumeler, *The Möbius Game: A Quantum-Inspired Test of General Relativity*, [arXiv:2407.17203 \[quant-ph\]](https://arxiv.org/abs/2407.17203), under consideration at Physical Review Letters
- 9-2023 | Eleftherios-Ermis Tselentis, and Ämin Baumeler, *The Möbius game and other Bell tests for relativity*, [arXiv:2309.15752 \[quant-ph\]](https://arxiv.org/abs/2309.15752), under consideration at Physical Review A
- 6-2022 | Ämin Baumeler, Borivoje Dakić, and Flavio Del Santo, *The Axiom of Choice and the No-Signaling Principle*, [arXiv:2206.08467 \[quant-ph\]](https://arxiv.org/abs/2206.08467), under consideration at Proceedings of the Royal Society A
- 4-2020 | Denis Rosset, Ämin Baumeler, Jean-Daniel Bancal, Nicolas Gisin, Anthony Martin, Marc-Olivier Renou, and Elie Wolfe, *Algebraic and geometric properties of local transformations*, [arXiv:2004.09405 \[quant-ph\]](https://arxiv.org/abs/2004.09405), under consideration at Quantum

## Oral contributions at conferences

- 9-2022 | *Admissible Causal Structures and Violations of Causal Inequalities*, Causalworlds Conference, ETH Zürich, Zürich, Switzerland  
(invited talk)
- 10-2021 | *Conservative Causality*, 17th QWebinar, [QWorld](https://www.qworld.ch/)  
(invited talk)
- 9-2021 | Ämin Baumeler, Amin Shiraz Gilani, Jibrán Rashid, *Unlimited non-causal correlations and their relation to non-locality*, Time in Quantum Theory: from mathematical foundations to operational characterization, ETH Zürich, Zürich, Switzerland  
(poster)
- 2-2021 | Ämin Baumeler, Amin Shiraz Gilani, Jibrán Rashid, *Unlimited non-causal correlations and their relation to non-locality*, 24th Annual Conference on Quantum Information Processing, Technical University of Munich, Munich, Germany  
(poster)
- 2-2020 | *Thermodynamics and Information*, Critical Natural Philosophy, Università della Svizzera italiana, Lugano, Switzerland  
(invited talk)
- 9-2019 | *Reversible time travel with freedom of choice*, The Time Machine Factory [unspeakable, speakable] on Time Travel (TM2019), Università di Torino, Turin, Italy  
(invited talk)
- 9-2019 | *Fixed points of quantum evolution on indefinite causal structures*, Causality in the Quantum World, Templeton Workshop, Anacapri, Italy  
(invited talk)
- 12-2018 | *Computational Complexity Theory and Causality*, 44th SFB Meeting, Atominstitut, Technical University Vienna, Vienna, Austria  
(talk)
- 9-2018 | *Causal loops: correlations and computation*, Annual Meeting of the Swiss Society for Logic and Philosophy of Science, Università della Svizzera italiana, Lugano, Switzerland  
(invited talk)
- 5-2018 | *Causal loops: logically consistent correlations, Time Travel, and Computation*, Ausgezeichnete Informatikdissertationen 2017, Leibniz-Zentrum für Informatik, Schloss Dagstuhl, Germany  
(invited talk)
- 4-2018 | *When causality is relaxed: classical correlations, computation, and time travel*, Algorithmic Information, Induction and Observers in Physics, Perimeter Institute for Theoretical Physics, Waterloo, Canada  
(invited talk)
- 11-2017 | *Reversible time travel with freedom of choice & implications for computation*, Indeterminism, at the Crossroad of Philosophy and Physics, Université de Genève, Geneva, Switzerland  
(invited talk)

- 11-2017 | *When causality is relaxed: implications for information processing and the foundations of physics*, The Message of Quantum Science II, How much have we learned in the past five years, ZiF, Universität Bielefeld, Bielefeld, Germany  
(invited talk)
- 12-2016 | *Subjective causality and causal loops*, Gandria Natural Philosophy Workshop, Gandria, Switzerland  
(talk)
- 2-2016 | *Correlations without global time*, 6th NCCR QSIT General Meeting, Arosa, Switzerland  
(talk)
- 12-2015 | *Processes without causal order as a model of computation*, Workshop on Quantum Nonlocality, Causal Structures and Device-Independent Quantum Information, National Cheng Kung University, Tainan, Taiwan  
(talk)
- 8-2015 | *Classical correlations without causal order: polytopes and purification*, Workshop Causality in a Quantum World, University of Queensland, Sunshine Coast, Queensland, Australia  
(talk)
- 6-2015 | *Classical correlations without causal order*, Workshop on Physics and Information, Institut Henri Poincaré, Paris, France  
(invited talk)
- 3-2015 | *Logically consistent behaviour incompatible with any causal order*, Münchenwiler Meeting on Logics, Münchenwiler, Switzerland  
(talk)
- 3-2015 | *On causal explanations of quantum nonlocality*, DPG Frühjahrstagung, Berlin, Germany  
(talk)
- 6-2014 | *Perfect signaling among three parties violating predefined causal order*, IEEE International Symposium on Information Theory (ISIT), Honolulu, Hawaii, USA  
(talk)
- 6-2014 | *Classical multi-party signaling violates predefined causal order maximally*, Quantum Theory: from Problems to Advances, QTPA, Linnæus University, Växjö, Sweden  
(talk)
- 8-2013 | *Specious Adversaries and Quantum Private Information Retrieval*, QCrypt, Waterloo, Canada  
(talk)

## Outreach activities

- 4-2022 | Podium discussion at "It's about time," Clubhouse  
<https://clubhousedb.com/club/595075278-it-s-about-time>
- 4-2022 | Magazine Interview, Science Notes, Germany  
<https://sciencenotes.de/shop/8-reisen/>
- 5-2021 | Newspaper Interview, Kurier/futurezone, Austria  
<https://futurezone.at/science/wie-zeitreisen-moeglich-sind-physik-raumzeit-schwarzes-loch/401388180>
- 5-2021 | National TV Interview, scobel, ZDF/3sat, Germany  
<https://pressetreff.3sat.de/programm/dossier/mappe/zeige/Special/wissenhoch2-ueber-forschung-fiktion-und-schwarze-loecher/>
- 10-2020 | National Radio Interview, Mitteldeutscher Rundfunk, Germany  
<https://www.mdr.de/wissen/zeitreisen-paradoxon102.html>
- 11-2019 | National Radio Interview, Dimensionen, Ö1, Austria  
<https://oe1.orf.at/programm/20191121/579428/Besuch-aus-der-Zukunft>
- 10-2019 | National TV Interview, ZIB 2, ORF, Austria



- Original content not available anymore; see instead: <https://www.iqoqi-vienna.at/detail/news/are-time-travels-theoretically-possible>
- 10-2018 | Panel discussion, Misterioso Jazz Club, The Institute, Zürich, Switzerland
- 7-2018 | Ämin Baumeler, *Why time travel is less implausible than you might think* (Editor's choice), Science Discoveries, De Gruyter  
<https://blog.degruyter.com/why-time-travel-is-less-implausible-than-you-might-think/>
- 5-2018 | Panel discussion, Sattelkammer, Bern, Switzerland
- 4-2017 | Talk at the Settimana della Svizzera italiana, Alpines Musem, Bern, Switzerland  
[https://www4.ti.ch/fileadmin/DECS/TEMI/Piu-italiano/documenti/settimana\\_della\\_svizzera\\_italiana/servizi-piuidentita-berna-brochure.pdf](https://www4.ti.ch/fileadmin/DECS/TEMI/Piu-italiano/documenti/settimana_della_svizzera_italiana/servizi-piuidentita-berna-brochure.pdf)
- 1-2016 | Magazine Interview, Quanta Magazine, US  
<https://www.quantamagazine.org/time-entanglement-raises-quantum-mysteries-20160119/>
- 4-2014 | Stefan Wolf, Ämin Baumeler, and Alberto Montina, *Una migliore comprensione delle leggi della natura grazie all'informatica quantistica*, article in SQUARE: USI-Magazine  
<http://www.press.usi.ch/square-13-2014-231468.pdf>