

# Melvyn Tyloo

Physicist at the University of Exeter

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## EDUCATION

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<b>PhD in Physics</b> <i>Swiss Federal Institute of Technology in Lausanne - EPFL</i>	Lausanne, Switzerland 2020
<b>Master of Science in Physics</b> <i>Swiss Federal Institute of Technology in Lausanne - EPFL</i>	Lausanne, Switzerland 2016
<b>Bachelor of Science in Physics</b> <i>Swiss Federal Institute of Technology in Lausanne - EPFL</i>	Lausanne, Switzerland 2014

## EXPERIENCE

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<b>University of Exeter</b> <i>Postdoc Research Fellow at the Living Systems Institute</i>	Oct. 2024 – Exeter, United Kingdom
<b>Los Alamos National Laboratory (LANL)</b> <i>Director's Postdoc Fellow at the Theoretical Division (T-4, T-5, CNLS)</i>	Feb. 2022 – Oct. 2024 Los Alamos, NM, United States
<ul style="list-style-type: none"><li>• Obtained research funding through the Laboratory directed research and development program: LDRD/PRD Fellowship as Director's Postdoc (3 years) and LDRD/ER Seedlings (1 year).</li><li>• 2 SPOT Awards for my contribution to the Laboratory's mission.</li><li>• Supervision of graduate students during Summer internships.</li><li>• Guest Editor for a focus issue in Journal of Physics: Complexity.</li><li>• Organization of satellite session at the Conference on Complex systems 2023, Salvador, Brazil.</li></ul>	
<b>University of Geneva</b> <i>Postdoctoral researcher at the Department of Quantum Matter Physics</i>	Apr. 2021 – Oct. 2021 Geneva, Switzerland
<ul style="list-style-type: none"><li>• Continuation of my previous postdoc position but with a funding from the University of Geneva.</li><li>• Supervision of a PhD candidate.</li><li>• Organization of satellite session at the Conference on Complex systems 2021, Lyon, France.</li></ul>	
<b>University of Applied Sciences of Western Switzerland</b> <i>Postdoctoral researcher and PhD candidate researcher in the School of Engineering</i>	Oct. 2016 – Feb. 2021 Sion, Switzerland
<ul style="list-style-type: none"><li>• Substitute lecturer for the class of General Physics and the Laboratory.</li><li>• Supervision of a PhD candidate.</li><li>• Organization of weekly seminars at the School of Engineering.</li><li>• Invited researcher at the Center for Nonlinear Studies (CNLS) at the Los Alamos National Laboratory.</li></ul>	
<b>Tutoring</b> <i>Tutor for physics, maths, chemistry, probability and programming.</i>	2011 – 2016 Lausanne, Switzerland
<ul style="list-style-type: none"><li>• One-on-one and group tutoring for students at EPFL and the University of Lausanne (UNIL).</li></ul>	

## SKILLS

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**Language**  
*French (native), English (fluent), German (intermediate).*

**Programming**  
*C++, Julia, Matlab.*

## RESEARCH INTERESTS

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- Statistical physics of coupled dynamical systems out-of-equilibrium.
- Synchronization of coupled dynamical systems.
- Resilience of networked systems to stochastic and deterministic perturbations.
- Inference of system parameters.
- Complex networks.

## ORGANIZATION OF INTERNATIONAL CONFERENCES

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5. Conference on Complex Systems (CCS) 2024, Exeter, England. **Member of the program committee.** Sep. 2-6, 2024 [Site]
4. Thirteenth International Conference on Complex Networks & Their Applications (Complex Networks 2024), Istanbul, Turkey. **Member of the program committee.** Dec. 10-12, 2024 [Site]
3. Twelfth International Conference on Complex Networks & Their Applications (Complex Networks 2023), Menton, France. **Member of the program committee.** Nov. 28-30, 2024 [Site]
2. Recent Advances in Learning and Data-Driven Modeling of Complex Systems, Satellite Symposium of the Conference on Complex Systems (CCS) 2023, Salvador, Brazil. **Organisation.** Oct. 18-19, 2023 [Site]
1. Data-based Diagnosis of Networked Dynamical Systems, Satellite Symposium of the Conference on Complex Systems (CCS) 2021, Lyon, France. Oct. 27, 2021 **Organisation.** [Site] [Link]

## EDITOR

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3. Journal of Physics: Complexity – Focus on Monitoring and Control of Complex Supply Systems. 2022-2023 **Editor** [Site]
2. Networks of Dynamical Systems, Frontiers in Network Physiology. 2022– **Review Editor** [Site]
1. Reviewer for: Journal of Physics: Complexity; Chaos; Physical Review Letters; Nature Communications; Nature Communications Physics; Physica Scripta; Entropy; Scientific Reports; Conference on Decision and Control; SIADS; Physica A; EPL; Physical Review E; IEEE TNSE; Chaos, Solitons and Fractals; Patterns; IEEE TPS.

## RESEARCH FUNDINGS

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2. Exploratory Research Seedlings at LANL. 1 years of funding.
1. Director’s Fellowship at LANL. 3 years of funding + additional material.

## PEER-REVIEWED PUBLICATIONS

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28. **M. Tyloo** (Invited Paper), *Resilience of the slow component in timescale-separated synchronized oscillators*, *Frontiers in Network Physiology*, **4**, 1399352 (2024). Insights in Networks of Dynamical Systems, Vol II. [Link].
27. J. Hindes, I.B. Schwartz, **M. Tyloo**, *Stability of Kuramoto networks subject to large and small fluctuations from heterogeneous and spatially correlated noise*, *Chaos* **33**, 113129 (2023). [Link].
26. **M. Tyloo**, *Assessing the impact of Byzantine attacks on coupled phase oscillators*, *J. Phys. Complex.* **4**, 045005 (2023). [Link].
25. R. Delabays, L. Pagnier, B. Schäfer, **M. Tyloo**, D. Witthaut (Guest Editors), *Focus on Monitoring and Control of Complex Supply Systems*, *J. Phys. Complex.* (2023). [Link].
24. **M. Tyloo** (Invited Paper), *Evolution of robustness in growing random networks*, *Entropy* **25**(9), 1340 (2023). Special Issue: Complexity, Entropy and the Physics of Information. [Link].
23. R. Delabays, A.Y. Lokhov, **M. Tyloo**, M. Vuffray (Featured in [Physics]), *Locating the source of forced oscillations in transmission power grids*, *PRX Energy* **2**, 023009 (2023). [Link]
22. **M. Tyloo** (Invited Comment), *More is definitely different: the zebrafish as witness: Comment on "Structure and function in artificial, zebrafish and human neural networks" by Peng Ji et al.*, *Physics of Life Reviews* **46**, 71-72 (2023). [Link].

21. **M. Tyloo**, J. Hindes, P. Jacquod, *Finite-time Correlations Boost Large Voltage-Angle Fluctuations in Electric Power Grids*, *J. Phys. Complex.* **4**, 015006 (2023). Focus on Monitoring and Control of Complex Supply Systems. [Link].
20. **M. Tyloo** (Invited Paper), *Faster network disruption from layered oscillatory dynamics*, *Chaos* **32**, 121101 (2022). Fast Track in the Focus Issue on Disruption of Networks and System Dynamics. [Link].
19. R. Delabays, **M. Tyloo**, *Heavy-tailed distribution of the number of papers within scientific journals*, *Quantitative Science Studies* **3** (3), 776-792 (2022). [Link].
18. **M. Tyloo**, *Layered complex networks as fluctuations amplifiers*, *J. Phys. Complex.* **3**, 03LT01 (2022). [Link].
17. P. Jacquod, **M. Tyloo**, *Propagation of non-Gaussian voltage angle fluctuations in high-voltage power grids*, *IFAC-PapersOnLine* **55-13** (2022) 67-72, *Necsys 22, Zürich, Switzerland, July 5-7, 2022*. [Link]
16. R. Delabays, L. Pagnier, **M. Tyloo**, *Locating fast-varying line disturbances with the frequency mismatch*, *IFAC-PapersOnLine* **55-13** (2022) 270-275, *Necsys 22, Zürich, Switzerland, July 5-7, 2022*. [Link]
15. J. Fritzsche, **M. Tyloo**, P. Jacquod, *Matrix Perturbation Theory of Inter-Area Oscillations*, *2021 60th IEEE Conference on Decision and Control (CDC)*, 3507-3512. [Link]
14. **M. Tyloo**, R. Delabays, P. Jacquod, *Reconstructing network structures from partial measurements*, *Chaos* **31**, 103117 (2021). [Link].
13. L. Pagnier, R. Delabays, **M. Tyloo**, *Locating line and node disturbances in networks of diffusively coupled dynamical agents*, *New J. Phys.* **23**, 043037 (2021). [Link].
12. **M. Tyloo**, R. Delabays, *System Size Identification from Sinusoidal Probing in Diffusive Complex Networks*, *J. Phys. Complex.* **2**, 025016 (2021). [Link].
11. R. Delabays, **M. Tyloo**, *Network inference using sinusoidal probing*, *IFAC-PapersOnLine* **54** (9), 696-700, *24th International Symposium on Mathematical Theory of Networks and Systems MTNS 2020: Cambridge United Kingdom*, (2021). [Link]
10. **M. Tyloo**, P. Jacquod, *Primary Control Effort in Realistic High-Voltage Power Networks*, *Proceedings of the 59th IEEE Conference on Decision and Control 2020*, (2020). [Link]
9. F. Baumann, I.M. Sokolov, **M. Tyloo**, *Periodic Coupling inhibits Second-order Consensus on Networks*, *Phys. Rev. E* **102**, 052313 (2020). [Link]
8. F. Baumann, I. M. Sokolov, **M. Tyloo**, *A Laplacian approach to stubborn agents and their role in opinion formation on influence networks*, *Phys. A* **557**, 124869 (2020). [Link]
7. **M. Tyloo**, P. Jacquod, *Primary Control Effort in Realistic High-Voltage Power Networks*, *IEEE Control Systems Letters*, **5** (3), (2020). [Link]
6. **M. Tyloo**, L. Pagnier, P. Jacquod, *The key player problem in complex oscillator networks and electric power grids: resistance centralities identify local vulnerabilities*, *Sci. Adv.* **5** (11), eaaw8359 (2019). [Link]
5. R. Delabays, **M. Tyloo**, P. Jacquod, *Rate of change of frequency under line contingencies in high voltage electric power networks with uncertainties*, *Chaos* **29**, 103130 (2019). Focus Issue on the Dynamics of Modern Power Grids [Link]
4. **M. Tyloo**, P. Jacquod, *Global robustness versus local vulnerabilities in complex synchronous networks*, *Phys. Rev. E* **100**, 032303 (2019). [Link]
3. **M. Tyloo**, R. Delabays, P. Jacquod, *Noise-induced desynchronization and stochastic escape from equilibrium in complex networks*, *Phys. Rev. E* **99**, 062213 (2019). [Link]

2. **M. Tyloo**, T. Coletta, P. Jacquod, *Robustness of synchrony in complex networks and generalized Kirchhoff indices*, *Phys. Rev. Lett.* **120**, 084101 (2018). [[Link](#)]
1. R. Delabays, **M. Tyloo**, P. Jacquod, *The size of the sync basin revisited*, *Chaos* **27**, 103109 (2017). [[Link](#)]

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SUBMITTED BUT NOT YET ACCEPTED/PUBLISHED PUBLICATIONS

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2. L. Pagnier, R. Delabays, **M. Tyloo**, *Nontrivial Kron Reduction for Power Grid Dynamics Modeling*, *arXiv:2409.09519* (2024). [[Link](#)]
1. **M. Tyloo**, M. Vuffray, L. Lokhov *Forced Oscillation Source Localization from Generator Measurements*, *arXiv:2310.00458* (2023). [[Link](#)]

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INVITED SPEAKER PRESENTATIONS

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21. Seminar ved Institutt for Fysikk, Norwegian University of Life Sciences. **Invited Speaker**. *Power grids: Energy transition, fluctuations and forced oscillations*. May. 2, 2024
20. Graduate Seminar, Mechanical Engineering, University of New Mexico (UNM), Albuquerque, NM, USA. **Invited Speaker**. *Stability of synchronized Kuramoto networks*. Apr. 12, 2024
19. CNLS Postdoc Seminar, Center for Nonlinear Studies, Los Alamos National Laboratory, Los Alamos NM, USA. **Invited Speaker**. *Forced oscillations identification from partial PMU coverage in high-voltage grids*. Jan. 18, 2024
18. Santa Fe Institute Seminar, Santa Fe, NM, USA. **Invited Speaker**. *Fluctuations in networked systems*. Sep. 11, 2023
17. Dynamics Days, symposium on *Coupled phase oscillators: Fundamentals to applications in Brain and Power Grid*, Naples, Italy. **Invited Speaker**. *Disruption of Kuramoto oscillator networks*. Sep. 3-8, 2023
16. Conclave on Complexity in Physical Interacting Systems, Computation and Thermodynamics, Santa Fe, NM, USA. **Invited Speaker**. *Tutorial on Synchronization*. Jul. 10-13, 2023
15. BLABS Seminar, T-4, Los Alamos National Laboratory, Los Alamos NM, USA. **Invited Speaker**. *Robustness of synchronous networks*. Apr. 24, 2023 [[Link](#)]
14. CNLS Postdoc Seminar, Center for Nonlinear Studies, Los Alamos National Laboratory, Los Alamos NM, USA. **Invited Speaker**. *Cyber and physical attacks on networked systems: the Byzantine generals problem and the energy transition*. Apr. 20, 2023
13. Applied Math Brown Bag, University of Arizona, Tucson, AZ, USA. **Invited Speaker**. *Robustness of synchronous networks*. Apr. 17, 2023 [[Link](#)]
12. Prof. De Lellis group seminar, University of Naples Federico II, Naples, Italy. **Invited Speaker**. *Noise transmission and disruption in layered complex networks*. Nov. 14, 2022 [[Link](#)]
11. CNLS Postdoc Seminar, Center for Nonlinear Studies, Los Alamos National Laboratory, Los Alamos NM, USA. **Invited Speaker**. *Heavy-tailed distribution of the number of papers within scientific journals*. Oct. 20, 2022 [[Link](#)]
10. CNLS Postdoc Seminar, Center for Nonlinear Studies, Los Alamos National Laboratory, Los Alamos NM, USA. **Invited Speaker**. *More complexity for richer network dynamics*. Aug. 18, 2022 [[Link](#)]
9. BLABS Seminar, T-4, Los Alamos National Laboratory, Los Alamos NM, USA. **Invited Speaker**. *Fault detection and inference in networks of diffusively coupled dynamical agents*. Apr. 11, 2022 [[Link](#)]
8. CNLS Seminar, Center for Nonlinear Studies, Los Alamos National Laboratory, Los Alamos NM, USA. **Invited Speaker**. *Local vulnerabilities and global robustness of equilibrium in network-coupled systems*. Mar. 16, 2022 [[Link](#)]

7. PhysCon2021, The 10th International Scientific Conference on Physics and Control, Fudan University, Shanghai, China. **Invited Speaker.** *Fault detection and probing in high-voltage power networks.* Oct. 4-8, 2021 [Link]
6. The 11th International Conference on Smart Grids, Green Communications and IT Energy-aware Technologies ENERGY 2021, Special Track on Modelling Dynamics of Power Grids (MoDyPoG). **Invited Speaker.** May 30-Jun.3, 2021 *Power grids: Small Signal Stability vs. Dynamical Parameters.* [Link]
5. Complexity in Energy Systems, satellite of Conference on Complex Systems (CCS) 2020, online conference. **Invited speaker.** *The Key Player Problem in High-Voltage Power Networks.* Dec.9-10, 2020 [Video]
4. Institute of Physics, Humboldt University, Berlin. **Invited speaker for the seminar talk.** *Near Equilibrium Dynamics and Transitions in Complex Network-Coupled Systems.* Oct.17, 2019 [Link]
3. Dynamics Days Europe 2019, Rostock, Germany. **Invited speaker in the Power Grid minisymposium.** *The Key Player Problem in Realistic Large-Scale Power Grids.* Sep.2-6, 2019 [Link]
2. Whiting School of Engineering, Johns Hopkins University, Baltimore, MD, USA. **Invited speaker for the group seminar** (Profs. D. Gayme and E. Mallada). *Quantifying Vulnerabilities of Complex Oscillatory Networks.* Aug.26-27, 2019 [Link]
1. National Renewable Energy Laboratory (NREL), Golden CO, USA. **Invited speaker of the Brown Bag Talk.** *Quantifying Fragility of Network-Coupled Oscillators and Electric Power Grids with Resistance Distances.* Jan.14, 2019 [Link]

#### CONTRIBUTIONS TO CONFERENCES

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25. 15th International Conference on Complex Networks, CompleNet 2024, Exeter, UK. Presentation. *Evolution of robustness of growing random networks.* Apr. 23-26, 2024 [Link]
24. 15th International Conference on Complex Networks, CompleNet 2024, Exeter, UK. Poster. *Byzantine attacks on coupled phase oscillators.* Apr. 23-26, 2024 [Link]
23. Dynamics Days US, UC Davis, CA, USA. Presentation. *Cyber-physical attacks on coupled phase oscillators* Jan. 8-10, 2024 [Link]
22. Conference on Complex Systems (CCS) 2023, Salvador, Brazil. Presentation. *Propagation of non-Gaussian noise in complex oscillatory networks and electric power grids.* Oct. 16-20, 2023
21. Collective Intelligence: Foundations + Radical Ideas A Santa Fe Institute Symposium & Short Course, Santa Fe, NM, USA. Participation Jun. 20-22, 2023.
20. NASPI Work Group Meeting and Vendor Show, Tempe, AZ, USA. Poster. *Locating the source of forced oscillations in transmission grids.* Apr. 4-5, 2023 [Link]
19. APS March Meetings, Las Vegas, NV, USA. Poster. *Fluctuations in Layered Complex Networks.* Mar. 5-11, 2023 [Link]
18. APS March Meetings, Las Vegas, NV, USA. Presentation. *Locating the source of forced oscillations in complex oscillator networks and power grids.* Mar. 5-11, 2023 [Link]
17. 2023 Grid Science Winter School and Conference, Santa Fe, NM, USA. Poster. *Primary control effort and noise propagation in high-voltage power grids.* Jan.9-13, 2023 [Link]
16. Complex Networks 2022, The 11th International Conference on Complex Networks and their Applications, Palermo, Italy. Oral presentation. *Noise transmission in layered complex networks.* Nov.8-10, 2022 [Link]
15. 5th Workshop on Autonomous Energy Systems, NREL, Golden, CO, USA. Poster. *Primary control effort and noise propagation in high-voltage power grids.* Jul.13-15, 2022 [Link]

14. Necsys 22, Zürich, Switzerland. **Paper presentation.** *Propagation of non-Gaussian voltage angle fluctuations in high-voltage power grids.* Jul.5-7, 2022 [[Link](#)]
13. Necsys 22, Zürich, Switzerland. **Paper presentation.** *Locating high-frequency line disturbances with the frequency mismatch.* Jul.5-7, 2022 [[Link](#)]
12. Dynamics Days Europe, Nice, France. Talk. *Reconstructing Network Structures from Partial Measurements.* Aug.23-27, 2021 [[Link](#)]
11. Networks 2021: A Joint Sunbelt and NetSci Conference. Talk. *Periodic coupling inhibits second-order consensus on networks.* Jun.21-Jul.10, 2021 [[Link](#)]
10. 59th IEEE Conference on Decision and Control, online conference. **Paper presentation.** *Primary Control Effort in Realistic High-Voltage Power Networks.* Dec.14-18, 2020
9. Conference on Complex Systems (CCS) 2020, online conference. Talk. *The key player problem in complex oscillator networks.* Dec.7-11, 2020 [[Video \(->16:59\)](#)]
8. Digital Dynamics Days 2020 (DDD2020), online conference. Talk. *A Laplacian approach to stubborn agents and their role in opinion formation on influence networks.* Aug.22-27, 2020 [[Video](#)]
7. Geometry of Complex Webs International Minicourse and Exploratory Workshop (GeoCow), Les Diablerets. Poster. *Coupled Oscillators vs. Opinion Formation.* Feb.2-5, 2020 [[Link](#)]
6. Future Electric Power Systems and the Energy Transition, 2nd International conference in Champéry, Switzerland. Oral presentation. *Resistance Centralities Identify Local Vulnerabilities in Electric Power Grids.* Feb.3-8, 2019 [[Link](#)]
5. 2019 Grid Science Winter School & Conference, Santa Fe NM, USA. Poster. *Robustness of Synchrony in Complex Networks, Generalized Kirchhoff Indices and Resistance Centralities.* Jan.7-11, 2019 [[Link](#)]
4. International School on Informatics and Dynamics in Complex Networks, University of Catania, Italy. Oral presentation. *Robustness of Synchrony in Complex Networks and Generalized Kirchhoff Indices.* **Best Presentation Award.** Oct.15-19, 2018 [[Link](#)]
3. Dynamics Days Europe 2018, Loughborough, England. Sep.3-7, 2018
2. 661. WE-Heraeus-Seminar: Nonlinear Dynamics, Optimization and Control of Distributed Energy Systems, Physikzentrum Bad Honnef, Germany. Poster. *Robustness of Synchrony in Electrical Grids and Generalized Kirchhoff Indices.* Jan.29-31, 2018 [[Link](#)]
1. Future Electric Power Systems and the Energy Transition, International conference in Champéry, Switzerland. Poster. *Numerical method to determine different power flow solutions.* Feb.5-9, 2017

#### VISITS IN RESEARCH GROUPS AND INSTITUTIONS

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11. Norwegian University of Life Sciences. Visiting researcher (Prof. L. Rydin). Apr. 29-May.3, 2024
10. Mechanical Engineering, University of New Mexico, Albuquerque, NM, USA. Visiting researcher (Prof. F. Sorrentino). Feb. 16, 2024
9. Santa Fe Institute, Santa Fe, NM, USA. Visiting researcher (Dr. Y. Zhang). Sep. 11-16, 2023
8. School of Engineering, University of Applied Sciences of Western Switzerland, Sion, Switzerland. Visiting researcher (Prof. P. Jacquod). Aug. 28-Sep. 1, 2023
7. Program in Applied Mathematics, University of Arizona, Tucson, AZ, USA. Visiting researcher (Dr. L. Pagnier, Prof. M. Chertkov). Apr. 12-19, 2023

6. Department of Electrical Engineering and Information Technology, University of Naples Federico II, Naples, Italy. Visiting researcher (Prof. De Lellis). Nov. 14-15, 2022
5. Statistical Physics and Nonlinear Dynamics & Stochastic Processes Group, Humboldt University, Berlin. Visiting researcher (Dr. F. Baumann, Prof. I.M. Sokolov). Sep. 6-11, 2019
4. Whiting School of Engineering, Johns Hopkins University, Baltimore, MD, USA. Visiting researcher (Profs. D. Gayme and E. Mallada). Aug. 26-27, 2019
3. Los Alamos National Laboratory (LANL), Theoretical Division T-5 and CNLS, Los Alamos, NM, USA. Invited researcher. Jul.-Aug., 2019
2. Center for Control, Dynamical Systems and Computation, University of California, Santa Barbara (UCSB). Visiting researcher (Prof. F. Bullo). Jan. 16-18, 2019
1. National Renewable Energy Laboratory (NREL), Golden, CO, USA. Visiting researcher (Dr. M. Colombino). Jan. 14-15, 2019