CV Jannik Ehrich

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current as of August 10, 2022

Research experience

2020 - now **Postdoctoral fellow** at the Simon Fraser University in Burnaby, BC, Canada in the groups of Prof. John Bechhoefer and Prof. David A. Sivak. Topic: Maxwell's demon in the real world: Constrains governing information processing

10 - 12/2018 **Visiting researcher** with Prof. Juan M.R. Parrondo at the Universidad Complutense de Madrid, Spain. Topic: Thermalization of systems in collisional baths

2016 - 2020 **Graduate research (Ph.D.)** at the Universität Oldenburg with Prof. Andreas Engel. Topic: Stochastic thermodynamics of systems with multiple interacting degrees of freedom, systems with hidden degrees of freedom, and microswimmers

2015 - 2016 **Graduate Research (Master)** at the Universität Oldenburg. Topic: Model illustrating how predictive information bounds energy dissipation in small biomolecular systems

04 - 09/2014 **Undergraduate Research** at the Universität Oldenburg. Topic: Analyzing and extending the 'Mandal-Jarzynski model' of Maxwell's demon

02 - 04/2014 **Internship** at ForWind, Center for Wind Energy Research, Oldenburg, Germany. Topic: Wind tunnel experiments on the effect of wind velocity gradients on cup anemometers

Education

02/2020 **Ph.D. (Dr. rer. nat.) in physics** with Prof. Andreas Engel, Universität Oldenburg, Germany. Thesis title: *Coupled and Hidden Degrees of Freedom in Stochastic Thermodynamics* (grade: *summa cum laude*)

10/2016 **Master studies in physics**, Universität Oldenburg, Germany, Degree: Master of Science (grade*: 1.0). Thesis title: *Thermodynamics of Predictive Information*

10/2014 **Bachelor studies in engineering physics**, Universität Oldenburg, Germany, Degree: Bachelor of Engineering (grade*: 1.0). Thesis title (translated): *Analysis of a model of Maxwell's demon*

2011 - 2012 **Bachelor studies in physics**, Jacobs University Bremen, Germany

*German grades are awarded on a scale from 1 to 4, 1.0 being the best possible grade.

Publications

peer reviewed: 10, first author: 4, co-first author: 1, h-index: 6, total citations: 149 **[Google Scholar]**

Preprints:

* T. K. Saha, **J. Ehrich**, Momčilo Gavrilov, Susanne Still, David A. Sivak, and John Bechhoefer, *Information engine in a nonequilibrium bath*, arXiv:2208.00288 (2022)

* **J. Ehrich**, Susanne Still, and D. A. Sivak, *Energetic cost of feedback control*, arXiv:2206.10793 (2022)

* T. K. Saha, J. N. E. Lucero, **J. Ehrich**, D. A. Sivak, and J. Bechhoefer , *Bayesian information engine that optimally exploits noisy measurements*, Phys. Rev. Lett. (in press), arXiv:2204.07310 (2022)

Published articles:

10 J. N. E. Lucero, **J. Ehrich**, J. Bechhoefer, and D. A. Sivak, *Maximal fluctuation exploitation in Gaussian information engines*, Phys. Rev. E **104**, 044122 (2021)

9. **J. Ehrich**, *Tightest bound on hidden entropy production from partially observed dynamics*, J. Stat. Mech., 083214 (2021)

8. T. K. Saha, J. N. E. Lucero, **J. Ehrich**, D. A. Sivak, and J. Bechhoefer, *Maximizing power and velocity of an information engine*, Proc. Natl. Acad. Sci. USA **118**, e2023356118 (2021), **PNAS Commentary, featured on SFU News**

7. S. J. Large, **J. Ehrich**, and D. A. Sivak, *Free energy transduction within autonomous systems*, Phys. Rev. E **103**, 022140 (2021)

6. K. Proesmans, **J. Ehrich**, and J. Bechhoefer *Optimal finite-time bit erasure under full control*, Phys. Rev. E **102**, 032105 (2020)

5. K. Proesmans, **J. Ehrich**, and J. Bechhoefer *Finite-time Landauer Principle*, Phys. Rev. Lett. **125**, 100602 (2020),
Editor's Suggestion, featured on phys.org

4. **J. Ehrich**, M. Esposito, F. Barra, and J.M.R. Parrondo, *Micro-reversibility and thermalization with collisional baths*, Physica A **552**, 122108 (2020)

3. **J. Ehrich** and M. Kahlen, *Approximating microswimmer dynamics by active Brownian motion: Energetics and efficiency*, Phys. Rev. E **99**, 012118 (2019)

2. M. Kahlen and **J. Ehrich**, *Hidden slow degrees of freedom and fluctuation theorems: an analytically solvable model*, J. Stat. Mech, 063204 (2018)

1. **J. Ehrich** and A. Engel, *Stochastic thermodynamics of interacting degrees of freedom: Fluctuation theorems for detached path probabilities*, Phys. Rev. E **96**, 012118 (2017)

Talks and conference contributions

Invited talks (5):

07/2021 *Information thermodynamics with some biophysics spice*, Quantitative Biological Physics in Canada Seminar, online

01/2020 *Stochastic thermodynamics with hidden degrees of freedom*, Physics Seminar, Université du Luxembourg

09/2019 *Stochastic thermodynamics with hidden degrees of freedom*, Workshop on *Fundamental Aspects of Statistical Mechanics and the Emergence of Thermodynamics in Nonequilibrium Systems*, Hanse-Wissenschaftskolleg, Delmenhorst, Germany

11/2018 *Fluctuation Theorems for Interacting Systems and Systems with Hidden Degrees of Freedom*, Seminar of the Group of Statistical Mechanics, Dto. Física Atómica, Molecular y Nuclear, Universidad Complutense de Madrid, Spain

09/2018 *Overview: Stochastic Thermodynamics and Fluctuation Theorems*, Retreat of the Turbulence, Wind Energy and Stochastics group of the Carl von Ossietzky Universität Oldenburg, Neu Sammit, Germany

Contributed talks (7):

06/2022 *Ratchets, ratchets everywhere! How information can fuel molecular machines and why you should care*, Frontiers in Biophysics 2022, Vancouver, BC, Canada

07/2021 *Maximizing the performance of an information engine*, Information Engines at the Frontiers of Nanoscale Thermodynamics, Telluride, CO, online, USA

06/2021 *Maximizing the performance of an information engine*, Joint European Thermodynamics Conference (JETC21), Prague, online, Czech Republic

05/2021 *Tight bounds on hidden entropy production from partially observed dynamics*, Workshop on Stochastic Thermodynamics II, Santa Fe Institute, online, USA

03/2021 *Finite-Time Landauer Principle*, APS March Meeting 2021, online, USA

07/2019 *How to deal with hidden degrees of freedom in stochastic thermodynamics?*, StatPhys27, Buenos Aires, Argentina

04/2019 *Approximating microswimmer dynamics by active Brownian motion: Energetics and efficiency*, DPG-Spring Meeting (Annual Conference of the German Physical Society), Regensburg, Germany

03/2018 *Fluctuation Theorems for Detached Path Probabilities*, DPG-Spring Meeting and EPS-CMD27, Berlin, Germany

Posters (6):

01/2021 *Minimizing the energetic costs of fast computations*, SFU Physics *2021 Poster competition*, Burnaby, Canada

09/2018 *Hidden slow degrees of freedom and fluctuation theorems*, stet18, workshop on *Stochastic Thermodynamics: Experiment and Theory*, Dresden, Germany

03/2018 *Hidden slow degrees of freedom and fluctuation theorems: an analytically solvable model*, DPG-Spring Meeting and EPS-CMD27, Berlin, Germany

04/2017 *On the Role of Latent Variables in Stochastic Thermodynamics*, workshop on *Non-Markovianity and Strong Coupling Effects in Thermodynamics*, Bad Honnef, Germany

03/2017 *On the Role of Latent Variables in Stochastic Thermodynamics*, DPG-Spring Meeting, Dresden, Germany

07/2016 *On the Thermodynamics of Predictive Information*, conference on *Statistical physics methods in biology and computer science* (StatPhys satellite meeting), Paris, France

Peer Review

2 each	Physical Review Letters Physical Review E
1 each	Physical Review X Nature Communications Physical Review Research Journal of Statistical Physics

Professional Societies

since 2020	Biophysical Society of Canada
since 2020	European Physical Society
since 2011	German Physical Society

Teaching and mentoring

2021	**Co-supervisor** of summer student
2018	**Substitute lecturer** (4 weeks) of theoretical quantum mechanics
2016 - 2019	**Thesis co-supervisor** of three Bachelor students and subsequent thesis review
2016 - 2019	Several **tutorials** in theoretical physics (classical mechanics, electrodynamics, quantum mechanics, and statistical physics)
2012 - 2016	Several **tutorials** in experimental physics (classical mechanics, optics, electrodynamics, atomic physics, and thermodynamics)

Service

2021 - 2022	**President** of the Simon Fraser University Postdoctoral Association
2020 - 2021	**Vice President - External Communications** of the Simon Fraser University Postdoctoral Association

Popular Science

Invited Speaker at the *Klaus-von-Klitzing-award* ceremony (2017), the state youth science competition *Jugend forscht* (2018), and the *pedagogic week* (2018), all hosted in Oldenburg, Germany

Finalists at the *groschen 2018*, a science-communication competition for a 10.000€ prize awarded by the *Landessparkasse zu Oldenburg*, Germany

Science Slams in Bremen, Oldenburg, Hannover, Lübeck, Osnabrück, and Ulm, Germany. Northern German Science Slam champion and contestant in the German finals of 2017

Awards and honors

06/2019	Young Scientist participant at the **Lindau Nobel Laureate Meeting** 2019
2017	**'Golden brains'** for winning the Science Slams in Oldenburg and Bremen
2016	Master's **degree with honors**

2014	Bachelor's **degree with honors**
2013, 2014, and 2015	Three consecutive *Landesstipendien* (**state scholarships**) covering the tuition fees (500€) at the public Universität Oldenburg
2011	**Partial Scholarship** (25%) towards the tuition fees at the private Jacobs University, Bremen

Miscellaneous

Languages: German (native), English (professional), French (intermediate), Dutch (basic)

Computer skills: Matlab, C, Java, Maple, LaTeX, MSOffice, Linux

Jannik Ehrich
Burnaby, August 10, 2022