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**Affiliation**

Hasselt University, Faculty of science
research group: Theory Lab.

Education

- 2004: PhD, Limburgs Univ. Centrum, Diepenbeek
Title: *Surprises in brownian motion: Brownian donkeys and Parrondo's paradox.*
- 1999: Licentiaat in de Natuurkunde, Universiteit Antwerpen, Antwerpen
- 1997: Kandidaat in de Natuurkunde, Limburgs Univ. Centrum, Diepenbeek

Research Topics

The central theme of my research is the statistical physics of systems out of equilibrium. The topics under study are: work and fluctuation theorems, thermodynamic efficiency at maximum power, stochastic thermodynamics, Brownian motors and refrigerators, electrochemical and electro-optical nano-devices. Where possible, a connection is made with applications in biology and nano-technology. Examples of past and present research subjects are:

- Fluctuations and dissipation of work in a Joule experiment.
- Performance characteristics of nano-scale devices.
- Anomalous diffusion of proteins in cellular membranes.
- Diffusion of interacting particles in nano-structured systems, eg. zeolites.

Research Projects

Promoter

- General aspects of Stochastic Thermodynamics: stochastic impedance and thermodynamics of Brownian particles (BOF-BILA) 01.03.2021 - 31.12.2023
- Stochastic Impedance (BOF) 01.03.2020 - 29.02.2024
- Large deviations in non-equilibrium processes (FWO) 01.10.2018 - 30.09.2021
- Geometric phases in stochastic processes (BOF) 16.09.2015 - 15.09.2018

Co-Promoter

- Thermodynamic and mechanical properties of nucleic acids (BOF) 01.07.2022 - 30.06.2026

- Machine-learning-enhanced identification of electron transporting biomolecules in electroactive microorganisms using combined Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS) and Scanning Probe Microscopy (SPM) data (FWO) 01.11.2021 - 31.10.2023
- Living electrical wires: unravelling the intrinsic electrical properties of Cable Bacteria filaments (BOF) 01.10.2019 - 30.09.2023
- Irreversibility and efficiency in small-scale systems (FWO) 01.01.2011 - 31.12.2014
- Irreversibility and efficiency in small-scale systems (BOF) 01.01.2010 - 31.12.2013
- Fluctuations and dissipation in small systems (FWO-Postdoc) 01.10.2007 - 30.09.2010

Outreach activities

- Deputy board member of the Belgian Physical Society
- Member of the Organising Committee of the Flemish Physics Olympiads

Publications

41. Fernando S. Filho, Bruno A. N. Akasaki, Carlos E. F. Noa, Bart Cleuren, and Carlos E. Fiore, *Thermodynamics and efficiency of sequentially collisional Brownian particles: The role of drivings*, Phys. Rev. E (2022)
40. Robin Bonne, Ji-Ling Hou, Jeroen Hustings, Koen Wouters, Mathijs Meert, Silvia Hidalgo-Martinez, Rob Cornelissen, Filippo Morini, Sofie Thijs, Jaco Vangronsveld, Roland Valcke, Bart Cleuren, Filip J. R. Meysman, and Jean Manca, *Intrinsic electrical properties of cable bacteria reveal an arrhenius temperature dependence*, Scientific Reports **10** (2020).
39. Bart Cleuren and Karel Proesmans, *Stochastic impedance*, Physica A-Statistical Mechanics and its Applications **552** (2019).
38. Raghavendran Thiruvallur Eachambadi, Robin Bonne, Rob Cornelissen, Silvia Hidalgo-Martinez, Jaco Vangronsveld, Filip J. R. Meysman, Roland Valcke, Bart Cleuren, and Jean Manca, *An ordered and fail-safe electrical network in cable bacteria*, Advanced Biosystems (2020).
37. Filip J. R. Meysman, Rob Cornelissen, Stanislav Trashin, Robin Bonne, Silvia Hidalgo Martinez, Jasper van der Veen, Carsten J. Blom, Cheryl Karman, Ji-Ling Hou, Raghavendran Thiruvallur Eachambadi, Jeanine S. Geelhoed, Karolien De Wael, Hubertus J. E. Beaumont, Bart Cleuren, Roland Valcke, Herre S. J. van der Zant, Henricus T. S. Boschker, and Je V. Manca, *A highly conductive fibre network enables centimetre-scale electron transport in multicellular cable bacteria*, Nature Communications **10** (2019).
36. Karel Proesmans, Bart Cleuren, and Christian Van den Broeck, *Power-efficiency-dissipation relations in linear thermodynamics*, Phys. Rev. Letters **116** (2016).
35. Thijs Becker, Kwinten Nelissen, Bart Cleuren, Bart Partoens, and Christian Van den Broeck, *Comment on “generalized exclusion processes: Transport coefficients”*, Phys. Rev. E **93** (2016).
34. Karel Proesmans, Bart Cleuren, and Christian Van den Broeck, *Linear stochastic thermodynamics for periodically driven systems*, J. of Stat. Mech.-Theory and Experiment **2016** (2016).
33. Karel Proesmans, Cedric Driesen, Bart Cleuren, and Christian Van den Broeck, *Efficiency of single-particle engines*, Phys. Rev. E **92** (2015).

32. Bart Cleuren, Bob Rutten and Christian Van den Broeck, *Universality of efficiency at maximum power macroscopic manifestation of microscopic constraints*, European Physical Journal-Special Topics **224** (2015).
31. Thijs Becker, Kwinten Nelissen, and Bart Cleuren, *Current fluctuations in boundary driven diffusive systems in different dimensions: a numerical study*, New Journal of Physics **17** (2015).
30. Thijs Becker, Tim Willaert, Bart Cleuren, and Christian Van den Broeck, *Echo states for detailed fluctuation theorems*, Phys. Rev. E **91** (2015).
29. Karel Proesmans, Bart Cleuren, and Christian Van den Broeck, *Stochastic efficiency for effusion as a thermal engine*, EPL **109** (2015).
28. Thijs Becker, Kwinten Nelissen, Bart Cleuren, Bart Partoens, and Christian Van den Broeck, *Adsorption and desorption in confined geometries: A discrete hopping model*, European Physical Journal-Special Topics **223** (2014).
27. Thijs Becker, Kwinten Nelissen, Bart Cleuren, Bart Partoens, and Christian Van den Broeck, *Diffusion of interacting particles in discrete geometries: Equilibrium and dynamical properties*, Phys. Rev. E **90** (2014).
26. Tim Willaert, Bart Cleuren, and Christian Van den Broeck, *Fluctuation symmetry in a two-state markov model*, Eur. Phys. J. B **87** (2014).
25. Hans Hooyberghs, Bart Cleuren, Alberto Salazar, Joseph O. Indekeu, and Christian Van den Broeck, *Efficiency at maximum power of a chemical engine*, J. of Chem. Phys **139** (2013).
24. Thijs Becker, Kwinten Nelissen, Bart Cleuren, Bart Partoens, and Christian Van den Broeck, *Diffusion of interacting particles in discrete geometries*, Phys. Rev. Letters **111** (2013).
23. Ben De Clercq, Bart Cleuren, Hendrik Deschout, Kevin Braeckmans, and Marcel Ameloot, *Distinguishing free and anomalous diffusion by rectangular fluorescence recovery after photobleaching: a monte carlo study*, J. of Biomedical Optics **18** (2013).
22. Bart Cleuren, Bob Rutten, and Christian Van den Broeck, *Cleuren et al. reply*, Phys. Rev. Letters **109** (2012).
21. Bart Cleuren, Bob Rutten, and Christian Van den Broeck, *Cooling by heating: Refrigeration powered by photons*, Phys. Rev. Letters **108** (2012).
20. Bob Rutten, Massimiliano Esposito, and Bart Cleuren, *Reaching optimal efficiencies using nanosized photoelectric devices*, Phys. Rev. B **80** (2009).
19. Bart Cleuren and Ralf Eichhorn, *Dynamical properties of granular rotors*, J. of Stat. Mech.-Theory and Experiment (2008).
18. Bart Cleuren, Koen Willaert, Andreas Engel, and Christian Van den Broeck, *Fluctuation theorem for entropy production during effusion of a relativistic ideal gas*, Phys. Rev. E **77** (2008).
17. Bart Cleuren, Christian Van den Broeck, and Ryoichi KAWAI, *Fluctuation and dissipation*, Comptes Rendus Physique **8** (2007).
16. Bart Cleuren and Christian Van den Broeck, *Fluctuation theorem for black-body radiation*, Europhysics Letters **79** (2007).
15. Bart Cleuren and Christian Van den Broeck, *Granular brownian motor*, EPL **77** (2007).
14. Pau Amengual, Pascal Meurs, Bart Cleuren, and Raul Toral, *Reversals of chance in paradoxical games*, Physica A-Statistical Mechanics and its Applications **371** (2006).

13. Bart Cleuren, Christian Van den Broeck, and Ryoichi Kawai, *Fluctuation theorem for the effusion of an ideal gas*, Phys. Rev. E **74** (2006).
12. Bart Cleuren, Christian Van den Broeck, and Ryoichi Kawai, *Fluctuation and dissipation of work in a joule experiment*, Phys. Rev. Letters **96** (2006).
11. Ralf Eichhorn, Peter Reimann, Bart Cleuren, and Christian Van den Broeck, *Moving backward noisily*, Chaos **15** (2005).
10. Ralf Eichhorn and Bart Cleuren, *Current reversals in the response behavior of a brownian particle*, Fluctuations and Noise Letters **4** (2004).
9. Bart Cleuren and Christian Van den Broeck, *Optimizing strategies in the primary parrondo paradox*, Phys. Rev. E **70** (2004).
8. Bart Cleuren and Christian Van den Broeck, *Primary parrondo paradox*, Europhysics Letters **67** (2004).
7. Christian Van den Broeck and Bart Cleuren, *Parrondo games with strategy*, NOISE IN COMPLEX SYSTEMS AND STOCHASTIC DYNAMICS II, PROCEEDINGS OF THE SOCIETY OF PHOTO-OPTICAL INSTRUMENTATION ENGINEERS (SPIE), SPIE-INT SOCIETY OPTICAL ENGINEERING, 2004, Conference on Noise in Complex Systems and Stochastic Dynamics.
6. Bart Cleuren and Christian Van den Broeck, *Brownian motion with absolute negative mobility*, Phys. Rev. E **67** (2003).
5. Christian Van den Broeck, Bart Cleuren, Ryoichi Kawai, and M Kamboj, *A trio of brownian donkeys*, Int. J. of Mod. Phys. C **13** (2002).
4. Bart Cleuren and Christian Van den Broeck, *Directed transport by pumping of excited states*, Phys. Rev. E **66** (2002).
3. Bart Cleuren and Christian Van den Broeck, *Random walks with absolute negative mobility*, Phys. Rev. E **65** (2002).
2. Bart Cleuren and Christian Van den Broeck, *Ising model for a brownian donkey*, Europhysics Letters **54** (2001).
1. Willy Malfliet and Bart Cleuren, *Analytical solution of a reaction-diffusion problem in chemical physics*, Ukrainian journal of physics **45** (2000).

Referee activities

I have been an active referee for several international journals, including New Journal of Physics, Phys. Rev. Letters, European Journal of Physics, Physical Review Applied, Phys. Rev. E, Fluctuations and Noise Letters, Physica A, Physica D, European Physical Journal B, Chaos, Journal of Magnetism and Magnetic Material, EP, International Journal of Modern Physics B, Journal of Statistical Physics, Physics Letters A, European Journal of Physics, The Journal of Physical Chemistry, RSC Advances, European Physical Journal-Special Topics, Physical Chemistry Chemical Physics