Izaak Neri (25 May 1983, Belgian) Last updated 10.9.2019:

Contact Information

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Current Position

Sep 2018 - now **Lecturer**
Department of Mathematics, King's College London

Postdoctoral Experience

Sep 2016 - Aug 2018 **Postdoctoral Contract**
Max Planck Institute for the Physics of Complex Systems (Dresden)
Biological Physics Group of Prof. Dr. Frank Jülicher

Sep 2013 – Sep 2016 **ELBE PostDoctoral Fellowship**
Max Planck Institute for the Physics of Complex Systems
Max Planck Institute of Molecular Cell Biology and Genetics
Joint postdoc in the groups of Prof. Dr. Frank Jülicher and Prof. Dr. Marino Zerial

Sep 2010 – Sep 2013 **Postdoctoral contract on an ANR project**
University of Montpellier, Laboratoire Charles Coulomb (L2C)
Dr. Norbert Kern and Prof. Dr. Andrea Parmeggiani

Education

June 2020 **Fellow of the Higher Education Academy**

Recognition of attainment against the UK
Professional Standards Framework for teaching and learning support in higher education

Fev 2006- Jun 2010 **PhD. in Physics**
KU Leuven, Institute for Theoretical Physics
Prof. Dr. Désiré Bollé
Thesis: Statistical Mechanics of Spin Models on Graphs

Jul 2005 **Master of Science (Physics)**
Ghent University
Prof. Dr. Jan Ryckebusch

Thesis: High Tc Superconductivity and the Hubbard Model

Publications (30)

7 Physical Review Letters
1 Physical Review X
2 Physical Review E
1 Physical review B
4 Journal of Statistical Mechanics
1 New Journal of Physics
1 Physical Biology
2 Journal of Physics A
1 Europhysics Letters
1 Proceedings in IEEE
3 arXiv
2 Physical Review Research
2 Book chapters

Publication List **(top 5 publications marked by *)**

1. *Modelling the effect of ribosome mobility on the rate of protein synthesis*
   O. Dauloudet, I. Neri, J. C. Walter, J. Dorignac, F. Geniet, A. Parmeggiani
   arXiv:2009.14533

2. *Dynamical systems on large networks with predator-prey interactions are stable and exhibit oscillations*
   A. M. Mambuca, C. Cammarota, I. Neri
   arXiv: 2009.11211

3. *Localization and universality of eigenvectors in directed random graphs*
   F. L. Metz, I. Neri
   arXiv: 2007.13672

4. *Linear stability analysis of large dynamical systems on random directed graphs*
   I. Neri, F. L. Metz
   Phys. Rev. Research **2**, 033313 (2020)

5. *Universal transient behavior in large dynamical systems on networks*
   W. Tarnowski, I. Neri, P. Vivo
   Phys. Rev. Research **2**, 023333 (2020)

6. Second law of thermodynamics at stopping times
   I. Neri
   Phys. Rev. Lett. **124**, 040601 (2020)

7. *Spectral theory of sparse non-Hermitian random matrices*
   F.L. Metz, I. Neri, T. Rogers
   J. Phys. A: Math. Theor. **52,** 434003 (2019)

8. *Integral fluctuation relations for entropy production at stopping times*
   I. Neri, E. Roldán, S. Pigolotti, F. Jülicher

J. Stat. Mech. (2019) 104006

9. *Extreme Reductions of Entropy in an Electronic Double Dot*
   S. Singh, E. Roldán, I. Neri, I. M. Khaymovich, D. S. Golubev, V. F. Maisi, J. T. Peltonen, F. Jülicher, J. P. Pekola
   Phys. Rev. B **99**, 115422 (2019)

10. *Martingale Theory for Housekeeping Heat*
    R. Chétrite, S. Gupta, I. Neri, É. Roldán
    EPL **124,** 60006 (2018)

11. *Testing Optimality of Sequential Decision-Making* *
    M. Dörpinghaus, I. Neri, É. Roldán, H. Meyr, F. Jülicher
    arXiv: 1801.01574

12. *Generic Properties of Stochastic Entropy Production*
    S. Pigolotti, I. Neri, E. Roldán, and F. Jülicher
    Phys. Rev. Lett. **119**, 140604 (2017)

13. *Statistics of Infima and Stopping Times of Entropy Production and Applications to Active Molecular Processes* *
    I. Neri, E. Roldán, and F. Jülicher
    Phys. Rev. X **7**, 011019 (2017)

14. *An Information Theoretic Analysis of Sequential Decision-Making*
    M. Dörpinghaus, É. Roldán, I. Neri, H. Meyr, F. Jülicher
    IEEE International Symposium on Information Theory (ISIT), 3050-3054 (2017)

15. *Eigenvalue Outliers of non-Hermitian Random Matrices with a Local Tree Structure* *
    I. Neri, and F. L. Metz
    Phys. Rev. Lett. **117**, 224101 (2016)

16. *Decision Making in the Arrow of Time*
    E. Roldán, I. Neri, M. Dorpinghaus, H. Meyr, and F. Jülicher,
    Phys. Rev. Lett. **115**, 250602 (2015)

17. *Motor Protein Traffic Regulation by Supply-Demand Balance of Resources*
    L. Ciandrini, I.Neri, J-C Walter, O. Dauloudet, and A. Parmeggiani
    Phys. Biol. **11**, 056006 (2014)
    Featured article, and in the 2014 highlights of Physical Biology .

18. *On the Equivalence of Ising Models on 'Small-World' Networks and LDPC Codes on Channels with Memory*
    I. Neri, and N. S. Skantzos
    J. Phys. A **47**, 385002 (2014)

19. *Modelling Collective Cytoskeletal Transport and Intracellular Traffic*
    A. Parmeggiani, I. Neri, and N. Kern
    The Impact of Applications on Mathematics, 1-25 (2014)

20. *Exclusion Processes on Networks as Models for Cytoskeletal Transport*
    I. Neri, N. Kern, and A. Parmeggiani
    New Journal of Physics **15**, 085005 (2013)

21. *Modelling Cytoskeletal Traffic: an Interplay Between Passive Diffusion and Active Transport* *
    I. Neri, N. Kern, and A. Parmeggiani
    Phys. Rev. Lett. **110**, 098102 (2013)

22. *On the Spectra of Large Sparse Graphs with Cycles*
    D. Bollé, F. L. Metz, and I. Neri

Spectral Analysis, Differential Equations and Mathematical Physics:
A Festschrift in Honor of Fritz Gesztesy's 60th Birthday, pages 35-58 (2013)

23. *Spectra of Sparse non-Hermitian Random Matrices: an Analytical Solution*
I. Neri, and F. L. Metz
Phys. Rev. Lett. **109**, 030602 (2012)

24. *Totally Asymmetric Simple Exclusion Process on Networks*
I. Neri, N. Kern, and A. Parmeggiani
Phys. Rev. Lett. **107**, 068702 (2011)
Appeared in Physics

25. *Spectra of Regular Graphs with Loops*
F. L. Metz, I. Neri, and D. Bollé
Phys. Rev. E **84**, 055101 (2011)

26. *Localization Transition in Symmetric Random Matrices*
F. L. Metz, I. Neri, and D. Bollé
Phys. Rev. E **82**, 031135 (2010)

27. *The Phase Diagram of Lévy Spin Glasse*s
I. Neri, F. L. Metz, and D. Bollé,
J. Stat. Mech. P01010 (2010)

28. *The Cavity Approach to Parallel Dynamics of Ising Spins on a Graph* *
I. Neri, and D. Bollé
J. Stat. Mech. P08009 (2009)

29. *Gallager error-correcting codes for binary asymmetric channels*
I. Neri, N. S. Skantzos, D. Bollé
J. Stat. Mech. P08009 (2008)

Talks at International Conferences (18 --- 6 invited and 12 contributed)

1. *Eigenvalue outliers of non-hermitian random matrices with a local tree structure* **(invited)**
Random Geometries and Multifractality in Condensed Matter and Statistical Mechanics
24 June 2019 - 02 August 2019 (International Institute of Physics, Natal, Brazil)

2. *Stochastic thermodynamics with martingales* **(invited)**
Workshop on martingales in Finance and Physics
24 May 2019 (ICTP, Trieste, Italy)

3. *Martingale Theory for Universal Statistics of Stochastic Entropy Production* **(invited)**
Stochastic Thermodynamics: Experiment and Theory
10-14 September 2018 (Dresden, Germany)

4. *Eigenvalue Outliers of non-Hermitian Random Matrices with a Local Tree Structure* **(invited)**
XIII Brunel-Beilefeld Workshop on Random Matrix Theory
14 -16 December 2017 (Bielefeld, Germany)

5. *Stopping Times and Entropy Production of Nonequilibrium Steady States*
   Current and Future Trends in Stochastic Thermodynamics
   4 - 29 September 2017 (Nordita, Stockholm, Sweden)

6. *Universal Statistics of Infima and Stopping Times of Entropy Production*
   Climate Fluctuations and Non-Equilibrium Statistical Mechanics: an Interdisciplinary Dialogue
   17 - 21 July 2017 (Dresden, Germany)

7. *Universal Statistics of Entropy Production in Langevin Processes* **(invited)**
   Frontiers of Quantum and Mesoscopic Thermodynamics
   9 - 15 July 2017 (Prague, Czech Republic)

8. *Statistics of Infima and Stopping Times of Entropy Production and Applications to Active Molecular Processes*
   DPG Condensed Matter Section Spring Meeting
   6-10 March 2017 (Dresden, Germany)

9. *Eigenvalue Outliers of non-Hermitian Random Matrices with a Local Tree Structure*
   DPG Condensed Matter Section Spring Meeting
   6-10 March 2017 (Dresden, Germany)

10. *The Endosomal Network Regulates Signal Specificity and Robustness using Quanta of Phosphorylated Receptors*
    12th International Congress of Cell Biology
    21-25 July 2016 (Prague, Czech Republic)

11. First-passage fluctuation theorems
    DPG Condensed Matter Section Spring Meeting
    6-11 March 2016 (Regensburg, Germany)

12. Exclusion Processes on Networks **(invited)**
    VU TASEP conference
    11 June 2015 (Amsterdam, Netherlands)

13. Exclusion Processes on Networks
    DPG Condensed Matter Section Spring Meeting
    15-20 March 2015 (Berlin, Germany)

14. *Totally asymmetric simple exclusion process on networks*
    Journées de Physique Statistique
    24-25 January 2012 (Paris, France)

15. *Exclusion processes through networks*
    Traffic and Granular Flow
    25-27 September 2013 (Jülich, Germany)

16. *Modelling active transport and spatial-temporal organisation of motor proteins along the cytoskeleton*
    European conference on complex systems
    3-7 September 2012 (Brussels, Belgium)

17. *Transport on networks*
    Journées plénières, Physique de la cellule au tissue
    12-13 October 2011 (Lille, France)

18. *Steady states of spin models on graphs*
    Statistical Physics and Computer Science
    8-11 July 2010 (Beijing, China)

Posters at International Conferences (9)

1. *On a Test of Optimality for Decision Making*
   Frontiers of Quantum and Mesoscopic Thermodynamics
   9 - 15 July 2017 (Prague, Czech Republic)

2. *Infimum Law and First-Passage-Time Fluctuation Theorem for Entropy Production*
   Stochastic Physics in Biology, Gordon Research Conference
   8-13 May 2017 (Ventura, California)

3. *Infimum Law and First-Passage-Time Fluctuation Theorem for Entropy Production*
   Circle Meeting
   9-10 May 2016 (Paris, France)

4. *Infimum Law and First-Passage-Time Fluctuation Theorem for Entropy Production*
   The Information, Probability and Inference in Systems Biology Conference
   18-20 May 2016 (Klosterneuburg, Austria)

5. *Exclusion processes on networks*
   International Summer School Fundamental Problems in Statistical Physics XIII
   June 16-29 2013 (Leuven, Belgium)

6. *Modelling active transport and spatial-temporal organisation of motor proteins along the cytoskeleton*
   13eme Journées de la Matière Condensée,
   27-31 August 2012 (Montpellier, France)

7. *Modelling active transport and spatial-temporal organization of motor proteins along the cytoskeleton*
   DPG Physics School on Forces and Flow in Biological Systems
   23-28 September 2012 (Bad-Honnef, Germany)

8. *Transport on networks*
   Workshop on Systems Biology, 2nd Baltic Autumn School
   5-9 September 2011 (Lübeck, Germany)

9. *Gallager codes on asymmetric channel*
   Annual Conference of the Middle European Cooperation in Statistical Physics
   14-16 April 2008 (Puchberg-Wels, Austria)

Invited Talks at Scientific Institutes

1. *Second law of thermodynamics at stopping times*,
   Complex Systems Seminar, Queen Mary University of London
   28 January 2020 (London, United Kingdom)

2. *Second law of thermodynamics at stopping times*,
   DAMTP Statistical Physics and Soft Matter Seminar, University of Cambridge
   29 Octobre 2019 (Cambridge, United Kingdom)

3. *Stochastic thermodynamics with martingales*
   Theoretical Condensed Matter Seminar, University of Nottingham

14 June 2019 (Nottingham, United Kingdom)

4. *Eigenvalue Outliers of non-Hermitian Sparse Random Matrices*
   Disordered Systems Group, King's College London
   28 November 2017 (London, United Kingdom)

5. *Decision Making in the Arrow of Time*
   Laboratoire Charles Coulomb, Universite Montpellier 2
   14 December 2015 (Montpellier, France)

6. *Active Transport Processes along Networks*
   Institute for Theoretical Physics, KULeuven
   23 May 2012 (Leuven, Belgium)

Referral Activity

Phys. Rev. Lett., Phys. Rev. X, Phys. Rev. E, J. Phys. A: Math. and Theor., Europhys. Lett., J. Stat. Mech., Journal of Statistical Physics, Neural Computation, New Journal of Physics, Mathematical Biosciences, Entropy, Symmetry, Physica A: statistical mechanics and its applications, International Journal of Molecular Sciences

Member of thesis committees (PhD and Habilitation)

- Jean-Francois Derivaux, *Stochastic thermodynamics of transport systems and reactive systems: an extended local equilibrium approach*, 3rd of June 2020 (private defense) and 3rd of July 2020 (public defense)
- Dr. Jean-Charles Walter, *Modeling the formation and the positioning of intracellular macromolecular assemblies: application to bacterial DNA segregation*, Thesis for Habilitation, 24th of June 2020

Teaching Activities

- *Theory of Complex Networks (*2018-2021, 3 years)
- Equilibrium Analysis of Complex Systems (2019-2021, 2 years)
- Research Methods and Advanced Topics in Complex Systems (2018-2020, 2 years)
- Supervision of Master projects: 7 dissertations
- Undergraduate research fellowships: 2 projects

Supervision of PhD students

- Andrea Mambuca: Random matrix theory for the stability of networked systems with antagonistic interactions
- Giorgio Carugno: Phase coexistence and instabilities of polydisperse mixtures through the prism of random matrix theory

Research visits

- Scientific visit at the Federal University of Rio Grande do Sul for two weeks (29th of July till 9th of August 2019). Host: Prof. Fernando Metz at the Physics Institute

Awards

- *Best poster award* in the Workshop on Systems Biology, 2nd Baltic Autumn School, 5-9 September 2011 (Lübeck, Germany). Poster title: *Transport on networks*

- Outstanding APS Referee (lifetime award, received in 2020)

Organization of Workshops

Random Matrix Theory and Networks, 7-11 June 2021, Max Planck Institute for the Physics of Complex Systems