# Juraj Szavits-Nossan

Curriculum Vitae

## PERSONAL DETAILS


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| ADDRESS: | School of Biological Sciences, University of Edinburgh,<br>Mayfield Road, Edinburgh EH9 3JD, United Kingdom |
| EMAIL: | juraj.szavits.nossan@ed.ac.uk |
| WEBSITE: | https://jszavits.github.io/ |
| ORCID: | 0000-0002-1540-5209 |
| SCHOLAR: | scholar.google.co.uk/citations?user=hepr85QAAAAJ |


## HIGHLIGHTS

Published 25 papers (first author: 18, last author: 2, middle author: 4, single author: 1)
Was awarded a 3-year Leverhulme Trust Early-Career Fellowship (success rate $\approx$ 14%)
Lectured two undergraduate and graduate physics courses (University of Edinburgh)
Supervised 2 MPhys and 5 BSc students (University of Edinburgh)
Currently co-supervising a PhD student (University of Edinburgh)

## EDUCATION

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| OCT 2011 | Ph.D. in Nonequilibrium Statistical Physics, University of Zagreb, Croatia |
| MAR 2005 | B.Sc. in Theoretical Physics, University of Zagreb, Croatia |

## ACADEMIC EMPLOYMENT

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| *Current* | Postdoctoral Research Associate |
| APR 2021 | School of Biological Sciences, University of Edinburgh, UK<br>Research area: stochastic modelling of gene expression, queueing theory<br>PI: Ramon Grima |
| MAR 2021 | Research Fellow |
| SEP 2019 | School of Physics and Astronomy, University of Edinburgh, UK<br>Research area: stochastic modelling of mRNA translation |
| SEP 2019 | Leverhulme Trust Early Career Research Fellow |
| SEP 2016 | School of Physics and Astronomy, University of Edinburgh, UK<br>Research area: stochastic modelling of mRNA translation |
| AUG 2016 | Postdoctoral Research Associate |
| APR 2012 | School of Physics and Astronomy, University of Edinburgh, UK<br>Research areas: stochastic modelling of protein aggregation into amyloid fibrils; condensation phenomena in stochastic systems<br>PIs: Martin Evans, Rosalind Allen, Cait MacPhee and Mike Cates |
| MAR 2012 | Senior Research Assistant |
| NOV 2011 | Institute of Physics, Zagreb, Croatia |
| OCT 2011 | Research Assistant |
| APR 2005 | Institute of Physics, Zagreb, Croatia<br>PhD Title: Phase transitions in driven diffusive systems far from equilibrium<br>PhD Supervisor: Katarina Uzelac |

## GRANTS AND FELLOWSHIPS

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| 2016–2019 | Leverhulme Trust Early Career Fellowship, University of Edinburgh<br>Project title: “Deciphering rules for optimal protein biosynthesis”<br>Amount awarded: £78,000 |

## LIST OF PUBLICATIONS

**Under peer review:**

25. M. Ma, J. Szavits-Nossan, A. Singh and R. Grima, *Analysis of a detailed multi-stage model of stochastic gene expression using queueing theory and model reduction*, arXiv:2401.12661 (2024)

24. A. G. Nicoll, J. Szavits-Nossan, M. R. Evans and R. Grima, *Transient power-law behaviour following induction distinguishes between competing models of stochastic gene expression*, biorxiv:2023.12.30.573521 (2023)

**Peer-reviewed:**

23. J. Szavits-Nossan and R. Grima, *Solving stochastic gene expression models using queueing theory: a tutorial review*, accepted for publication in Biophysical Journal (**Review**)

22. L. Ciandrini, R. L. Crisostomo and J. Szavits-Nossan, *TASEPy: a Python-based package to iteratively solve the inhomogeneous exclusion process*, SciPost Phys. Codebases 22 (2023), 23pp

21. J. Szavits-Nossan and R. Grima, *Uncovering the effect of RNA polymerase steric interactions on gene expression noise: analytical distributions of nascent and mature RNA numbers*, Phys. Rev. E 108, 034405 (2023), 22pp

20. X. Meng, A. Reed, J. Szavits-Nossan and J. McCarthy, *Stochastic scanning events on the GCN4 mRNA 5' untranslated region generate cell-to-cell heterogeneity in the yeast nutritional stress response*, Nucleic Acids Research 51, 6609-6621 (2023), 12pp

19. J. Szavits-Nossan and R. Grima, *Steady-state distributions of nascent RNA for general initiation mechanisms*, Phys. Rev. Research 5, 013064 (2023), 13pp

18. J. Szavits-Nossan and R. Grima, *Mean-field theory accurately captures the variation of copy number distributions across the mRNA's life cycle*, Phys. Rev. E 105, 014410 (2022), 15pp
**Editors' Suggestion**

17. J. Szavits-Nossan and B. Waclaw, *Current-density relation in the exclusion process with dynamic obstacles*, Phys. Rev. E 102, 042117 (2020), 11pp

16. J. Szavits-Nossan and L. Ciandrini, *Inferring efficiency of translation initiation and elongation from ribosome profiling*, Nucleic Acids Research 48(17), 9478–9490 (2020), 13pp

15. J. Szavits-Nossan and M. R. Evans, *Dynamics of ribosomes in mRNA translation under steady and non-steady state conditions*, Phys. Rev. E 101, 062404 (2020), 12pp

14. S. Scott and J. Szavits-Nossan, *Power series method for solving TASEP-based models of mRNA translation*, Phys. Biol. 17, 015004 (2020), 16pp

13. J. Szavits-Nossan, M. Carmen Romano and L. Ciandrini, *Power series solution of the inhomogeneous exclusion process*, Phys. Rev. E 97, 052139 (2018), 13pp

12. J. Szavits-Nossan, L. Ciandrini and M. Carmen Romano, *Deciphering mRNA sequence determinants of protein production rate*, Phys. Rev. Lett. 120, 128101 (2018), 6pp

11. J. Szavits-Nossan, M. R. Evans and S. N. Majumdar, *Conditioned random walks and interaction-driven condensation*, J. Phys. A: Math. Theor. 50 024005 (2017), 28 pp
**"Emerging Talents" collection**

10. J. Szavits-Nossan and M. R. Evans, *Inequivalence of nonequilibrium path-ensembles: the example of stochastic bridges*, J. Stat. Mech. P12008 (2015), 22 pp

9. J. M. D. Kalapothakis, R. J. Morris, J. Szavits-Nossan, K. Eden, S. Covill, S. Tabor, J. Gillam, P. E. Barran, R. J. Allen and C. E. MacPhee, *A kinetic study of ovalbumin fibril formation: the importance of fragmentation and end-joining*, Biophys. J. 108(9), 2300–2311 (2015), 12pp

8. J. Szavits-Nossan, M. R. Evans and S. N. Majumdar, *Condensation transition in joint large deviations of linear statistics*, J. Phys. A: Math. Theor. 47, 455004 (2014), 31pp
**"Highlights of 2014" collection**

7. J. Szavits-Nossan, K. Eden, R. J. Morris, C. E. MacPhee, M. R. Evans and R. J. Allen, *Inherent variability in the kinetics of autocatalytic protein self-assembly*, Phys. Rev. Lett. 113, 098101 (2014), 5pp

6. J. Szavits-Nossan, M. R. Evans and S. N. Majumdar, *Constraint-driven condensation in large fluctuations of linear statistics*, Phys. Rev. Lett. 112, 020602 (2014), 5pp

5. J. Szavits-Nossan, *Disordered exclusion process revisited: some exact results in the low-current regime*, J. Phys. A: Math. Theor. 46, 315001 (2013), 24pp

4. J. Szavits-Nossan and K. Uzelac, *Absence of phase coexistence in disordered exclusion processes with bypassing*, J. Stat. Mech. P05030 (2011), 18pp

3. J. Szavits-Nossan and K. Uzelac, *Impurity-induced shocks in the asymmetric exclusion process with long-range hopping*, J. Stat. Mech. P12019 (2009), 13pp

2. J. Szavits-Nossan and K. Uzelac, *Scaling properties of the asymmetric exclusion process with long-range hopping*, Phys. Rev. E 77, 051116 (2008), 8pp

1. J. Szavits-Nossan and K. Uzelac, *Totally asymmetric exclusion process with long-range hopping*, Phys. Rev. E 74, 051104 (2006), 8pp

## TEACHING EXPERIENCE

**University of Edinburgh:**

Advanced Statistical Physics, lecturer, undergraduate course (2020/21, 2019/2020)
Nonequilibrium Statistical Physics, lecturer, graduate course (2018/19)

**University of Zagreb:**

Hydrodynamics, tutor, undergraduate course (2011/12)
Advanced Statistical Physics, tutor, undergraduate course (2008/09, 2009/10)
Statistical Physics, tutor, undergraduate course (2007/08)

## STUDENT SUPERVISION

1 PhD (co-supervisor), 2 Master's and 5 Senior Honours Projects, University of Edinburgh

## INVITED TALKS

2021 Dynamics of mRNA translation inferred from experimental data
Cologne Evolution Colloquium, 27 Jan

2020 Inferring efficiency of translation initiation and elongation from ribosome profiling
Riboviz UK-USA collaboration, 30 Sep

2019 Mathematical models for gene expression data
Growth and division in mathematics and medicine, London, 4–6 Nov

2019 Inferring translation dynamics from ribosome profiling data
Research Seminar, School of Biosciences, University of Kent, 1 Oct

2018 Mathematical modelling of mRNA translation: old questions and new insights
Reverse mathematical methods for reconstructing molecular dynamics in single cell, Pisa, 15–19 Oct

2018 mRNA sequence determinants of protein production rate
8th Regional Biophysics Conference, Zreče, 16–20 May
2016 Conditioned random walks and spatially-extended condensation
Condensation phenomena in stochastic systems, Bath, 5 Jul

## PROFESSIONAL ACTIVITIES

Editor Journal of Visualized Experiments (JoVE) Methods Collection (Guest Editor)
"Research methods for understanding the dynamics of gene expression"
Referee Physical Review E, Physical Review Letters, Physical Biology, Entropy, Integrative Biology, Journal of Statistical Mechanics: Theory and Experiment, Biophysical Journal, Journal of Physics A: Mathematical and Theoretical (full record available at Web of Science)

## CONFERENCES

2020 Online One-Day Meeting for Early Career Biological Physicists, 16 Dec
2020 Physics in Life and Medicine, online meeting, 14 Oct
2019 Growth and division in mathematics and medicine, London, 4–6 Nov (invited talk)
2019 20th IUPAB Congress and 12th EBSA Congress, Madrid, 20-24 Jul (talk)
2019 Translation UK, Glasgow, 3–5 Jul (talk)
2018 Reverse mathematical methods for reconstructing molecular dynamics in single cell, Pisa, 15–19 Oct (invited talk)
2018 8th Regional Biophysics Conference, Zreče, 16–20 May (invited talk)
2018 43rd MECO, Krakow, 1–4 May (poster)
2018 Open Statistical Physics, Milton Keynes, 21 Mar (talk)
2017 Quantitative Methods in Gene Regulation IV, Cambridge, 18–19 Dec (talk)
2017 19th IUPAB Congress and 11th EBSA Congress, Edinburgh, 16–20 Jul (poster)
2016 Condensation phenomena in stochastic systems, Bath, 5 Jul (invited talk)
2016 Physical Principles of Biological and Active Systems, Edinburgh, 6–7 Jan (talk)
2015 Statistical Mechanics of Non-Equilibrium Systems, London, 8–9 Jun (talk)
2015 40th MECO, Esztergom, 23–25 Mar (talk)
2014 Non-Equilibrium Processes at Negative Temperature, Glasgow, 23–24 Oct (talk)
2014 The Physics of Soft and Biological Matter, Cambridge, 14–16 Apr (poster)
2013 Fundamental Problems in Statistical Physics, Leuven, 16–29 Jun (poster)
2013 Statistical Mechanics of Disordered Systems, London, 20–21 May (talk)
2011 Foundations of Non-Equilibrium Statistical Mechanics, Stockholm, Sweden, 3–14 Oct
2010 35th MECO, Pont-a-Mousson, France, 15–19 Mar (poster)
2009 Many-body systems far from equilibrium, Dresden, Germany, 16–27 Feb (poster)
2008 Les Houches Summer School, Les Houches, France, 5–29 Aug (talk)
2008 33rd MECO, Puchberg/Wels, Austria, 14–16 Apr (poster)
2007 Les Houches Predoctoral School, Les Houches, France, 26 Aug–7 Sep (talk)
2007 XXIII IUPAP Conference on Statistical Physics, Genova, Italy, 9–13 Jul (poster)
2006 31st MECO, Primosten, Croatia, 23–26 Apr (poster)

## ADMINISTRATION

2012–2015 Statistical Physics Group Meetings organiser, University of Edinburgh
2008–2012 Linux High-Performance Computing Cluster administrator, Institute of Physics

## CAREER DEVELOPMENT

2018 EPSRC Early Careers Workshop, Glasgow
2017 Introduction to Python for Biologists, Edinburgh
2013 Summer School Fundamental Problems in Statistical Physics XIII, Leuven, Belgium
2008 Les Houches Summer School: Long-range interacting systems, France
2007 Les Houches Predoctoral School in Statistical Physics, France

## PROFESSIONAL MEMBERSHIPS

Croatian Physical Society (2006–)
Croatian Biophysical Society (2014–)
Network on Emergence and Physics far from Equilibrium, UK (2014–)
Physics of Life Network, UK (2017–)

## LANGUAGES

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| English | full professional proficiency |
| German | elementary proficiency |
| Croatian | native proficiency |