

Juraj Szavits-Nossan

PERSONAL DETAILS

address: School of Biological Sciences, University of Edinburgh,
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 23 publications (21 peer-reviewed and 2 under review), both in physics and biology journals
- ▶ Won 3-year Leverhulme Trust Early-Career Fellowship (success rate $\approx 14\%$)
- ▶ Lectured two physics courses at the University of Edinburgh
- ▶ Supervised 2 MPhys and 5 BSc physics students, currently co-supervising one PhD student, all at the University of Edinburgh

EDUCATION

Nov 2011 Ph.D. in Nonequilibrium Statistical Physics, University of Zagreb, Croatia
Mar 2005 B.Sc. in Theoretical Physics, University of Zagreb, Croatia

ACADEMIC EMPLOYMENT

Current Postdoctoral Research Associate
Apr 2021 School of Biological Sciences, University of Edinburgh, UK
Research area: stochastic modelling of gene expression, queueing theory
PI: Ramon Grima

Mar 2021 Independent Research Fellow
Sep 2019 School of Physics and Astronomy, University of Edinburgh, UK
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
Research area: stochastic modelling of mRNA translation

Aug 2016 Postdoctoral Research Associate
Apr 2012 School of Physics and Astronomy, University of Edinburgh, UK
Research areas: stochastic modelling of protein aggregation into amyloid fibrils; condensation phenomena in stochastic processes
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
PhD Title: Phase transitions in driven diffusive systems far from equilibrium
PhD Supervisor: Katarina Uzelac

GRANTS AND FELLOWSHIPS

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

LIST OF PUBLICATIONS

Under peer review:

23. L. Ciandrini, R. L. Crisostomo and J. Szavits-Nossan, *TASEPy: a Python-based package to iteratively solve the inhomogeneous exclusion process*, arXiv:2308.00847 (2023)
22. J. Szavits-Nossan and R. Grima, *Charting the landscape of stochastic gene expression models using queueing theory*, arXiv:2307.03253 (2023)

Peer-reviewed:

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*, accepted for publication in Phys. Rev. E, arXiv:2304.05304 (2023)
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

2 Master's and 5 Senior Honours Projects, University of Edinburgh

INVITED TALKS

- 2023 Steady-state distributions of nascent RNA for general initiation mechanisms
Stochastic Systems Seminar, University of California San Diego, 20 Apr
- 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 <https://www.webofscience.com/wos/author/record/E-8383-2011>)

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 Organiser, Statistical Physics Group Meetings, University of Edinburgh
2008–2012 Administrator, Linux High-Performance Computing Cluster, Institute of Physics

CAREER DEVELOPMENT

- 2018 EPSRC Early Careers Workshop, Glasgow
2017 Introduction to Python for Biologists course, 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

English full professional proficiency
German elementary proficiency
Croatian native proficiency

REFERENCES

Ramon Grima
Professor
School of Biological Sciences
University of Edinburgh
Mayfield Road
EH9 3JD Edinburgh
United Kingdom
ramon.grima@ed.ac.uk
+44 (0)131 651 9060

Maria Carmen Romano
Professor
Institute of Complex Systems and Mathematical Biology
University of Aberdeen
Old Aberdeen
AB24 3UE Aberdeen
United Kingdom
m.romano@abdn.ac.uk
+44 (0)1224 272507