

## CURRICULUM VITAE

### Édgar Roldán

Associate Research Officer

ICTP - Abdus Salam International Centre for Theoretical Physics  
Quantitative Life Sciences section  
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#### (a) Education

Universidad Complutense de Madrid	Madrid, Spain	Physics	Ph.D., <i>summa cum laude</i> , 2013
Universidad Complutense de Madrid	Madrid, Spain	Fundamental Physics	M. Sc., 2009
Universidad Complutense de Madrid	Madrid, Spain	Physics	B. Sc., 2008

#### (b) Research and Professional Experience

2018 – present	ICTP Associate Research Officer, Quantitative Life Sciences Section, ICTP, Trieste (Italy)
2017 – 2018	MPIPKS Distinguished Postdoctoral Fellow, MPIPKS, Dresden (Germany)
2014 – 2017	Postdoctoral fellow, Max-Planck Institute for the Physics of Complex Systems, Dresden (Germany)
2010 – 2014	Postdoctoral fellow, Optical Tweezers Lab, ICFO, Castelldefels (Spain)
2013	Postdoctoral fellow, Instituto de Ciencias de Materiales de Madrid, Madrid (Spain)

#### (c) Awards and Honors

- CNRS Chercheur Invite Federation Doebelin  
Universite Cote d'Azur, Nice (France), 2019
- CNRS Chair Joliot  
ESPCI, Paris (France), 2019
- EPS-SNPD Early Career Prize  
European Physical Society, 2017
- EPL Distinguished Referee  
European Physics Letters, 2017
- MPIPKS Distinguished Postdoctoral Fellow  
Max Planck Institute for the Physics of Complex Systems, 2017
- Liquid Art Contest - scientific artwork public outdoor display  
10th Liquid Matter Conference - LIQUIDS, Ljubljana (Slovenia), 2017
- Poster Prize, Gordon Research Conference "Stochastic Physics in Biology"  
Ventura, California (United States), 2017
- International Springer Theses Prize  
Springer, 2014
- PhD extraordinary prize  
Universidad Complutense de Madrid, Madrid (Spain), 2014

#### (d) Publications

(\* = corresponding or co-corresponding author)

1. G Manzano, D Subero, O Maillet, R Fazio, JP Pekola, É Roldán\*  
*Phys. Rev. Lett.* **126** (8), 080603 (2021)  
Editor's Suggestion
2. M N Qaisrani, R Belousov, J U Rehman, E M Goliaei, I Girotto, R Franklin-Mergarejo,  
O Güell, A Hassanali, É Roldán\*  
*Eur. Phys. J. E* **44**, 132 (2021)

3. D Sánchez-Taltavull *et al.*  
*PLOS ONE* **16**(11), e0258700 (2021)
4. É Roldán\*, J Barral, P Martin, JMR Parrondo, F Jülicher  
*New J. Phys.* **23**, 083013 (2021)
5. A Gopal, É Roldán\*, S Ruffo  
*J. Phys. A* **54** (16), 164001 (2021)
6. D Sánchez-Taltavull, V Castelo-Szekely, D Candinas, É Roldán, G Beldi  
*J. Theor. Biol.* **523**, 110718 (2021)  
Highlighted in ICTP news
7. G Tucci, A Gambassi, S Gupta, É Roldán\*  
*Phys. Rev. Res.* **2** (4), 043138 (2020)
8. AM Ramoso, JA Magalang, D Sánchez-Taltavull, JP Esguerra, É Roldán\*  
*EPL* **132** (5), 50003 (2020)
9. L Touzo, M Marsili, N Merhav, É Roldán  
*J. Stat. Mech.* **2020** (9), 093403 (2020)
10. R Belousov, MN Qaisrani, AA Hassanali, É Roldán\*  
*Soft Matter* **16**, 9202 (2020)  
Highlighted in back cover
11. A Guillet, É Roldán\*, F Jülicher  
*New J. Phys.* **22**, 123038 (2020)
12. J Bechhoefer, S Ciliberto, S Pigolotti, É Roldán\*  
*J. Stat. Mech.* **2020** (6), 064001 (2020)
13. S Singh, *et al.*  
*Phys. Rev. Lett.* **122** (23), 230602 (2019)
14. G Manzano, R Fazio, É Roldán\*  
*Phys. Rev. Lett.* **122** (22), 220602 (2019)
15. R Chétrite, S Gupta, I Neri, É Roldán\*  
*EPL* **124** (6), 60006 (2019)  
Editor's Suggestion
16. I Neri, É Roldán, S Pigolotti, F Jülicher  
*J. Stat. Mech.* **2019** (10), 104006 (2019)
17. É Roldán\*, P Vivo  
*Phys. Rev. E* **100** (4), 042108 (2019)
18. S Singh, *et. al*  
*Phys. Rev. B* **99**, 115422 (2019)
19. AC Barato, É Roldán\*, IA Martínez, S Pigolotti  
*Phys. Rev. Lett.* **121** (9), 090601 (2018)
20. L Lacasa, *et al.*  
*Phys. Rev. X* **8** (3), 031038 (2018)
21. S Pigolotti, I Neri, É Roldán\*, F Jülicher  
*Phys. Rev. Lett.* **119** (14), 140604 (2017)
22. I Neri, É Roldán\*, F Jülicher  
*Phys. Rev. X* **7** (1), 011019 (2017)
23. IA Martínez, É Roldán\*, L Dinis, RA Rica  
*Soft Matter* **13** (1), 22-36 (2017)
24. A Lisica, C Engel, M Jahnel, É Roldán, EA Galburt, P Cramer, SW Grill  
*PNAS* **113** (11), 2946-2951 (2016)

25. É Roldán, A Lisica, D Sánchez-Taltavull, SW Grill  
*Phys. Rev. E* **93** (6), 062411 (2016)
26. L Dinis, IA Martínez, É Roldán, JMR Parrondo, RA Rica  
*J. Stat. Mech.* **2016** (5), 054003 (2016)
27. IA Martínez, É Roldán, L Dinis, D Petrov, JMR Parrondo, RA Rica  
*Nature Phys.* **12**, 67-70 (2015)
28. É Roldán, I Neri, M Dörpinghaus, H Meyr, F Jülicher  
*Phys. Rev. Lett.* **115** (25), 250602 (2015)
29. IA Martínez, É Roldán, L Dinis, D Petrov, RA Rica  
*Phys. Rev. Lett.* **114** (12), 120601 (2015)
30. L Granger, J Mehlis, É Roldán, S Ciliberto, H Kantz  
*New J. Phys.* **17**, 065005 (2015)
31. É Roldán, IA Martínez, JMR Parrondo, D Petrov  
*Nature Phys.* **10**, 457-461 (2014)
32. É Roldán, IA Martínez, L Dinis, RA Rica  
*Appl. Phys. Lett.* **104** (23), 234103 (2014)
33. É Roldán  
*Irreversibility and Dissipation in Microscopic Systems*, Springer Theses (2014)
34. IA Martínez, É Roldán, JMR Parrondo, D Petrov  
*Phys. Rev. E* **87** (3), 032159 (2013)
35. L Lacasa, A Nunez, É Roldán, JMR Parrondo, B Luque  
*Eur. Phys. J. B* **85** (6), 1-11 (2012)
36. É Roldán, JMR Parrondo  
*Phys. Rev. E* **85** (3), 031129 (2012)
37. É Roldán, JMR Parrondo  
*Phys. Rev. Lett.* **105**, 150607 (2010)

**(e) Citation Metrics (Google Scholar)**

- Number of citations: 1911
- h-index: 19
- i-10 index: 27

**(f) Preprints and Conference Proceedings**

1. G Manzano, É Roldán  
arXiv:2109.03260 (2021)  
Submitted to *Phys. Rev. Lett.*
2. H Hamzi, A Rajabpour, É Roldán, A Hassanali  
arXiv:2109.01462 (2021)  
Submitted to *J. Chem. Phys. B*
3. M Dörpinghaus, É Roldán, I Neri, H Meyr and F Jülicher  
IEEE International Symposium on Information Theory (ISIT), 3051 (2017)

**(g) Organization of International Workshops, Conferences and Schools**

1. Workshop "Statistical Physics of Complex Systems" | (smr 3624)  
ICTP-SISSA Hybrid workshop, 2021
2. ICTP-SISSA-CECAM Workshop on Molecular Dynamics  
and its Applications to Biological Systems | (smr 3627)  
ICTP-SISSA Online workshop, 2020

3. Joint QLS-CMSP Virtual Summer Retreat on Heat, Water, Noise, and Life I (smr 3550)  
ICTP Online workshop, 2020
4. Workshop on Martingales in Finance and Physics  
ICTP, Trieste (Italy), 2019
5. Biophysical conference  
Hotel Amfora, Hvar (Croatia), 2019
6. Stochastic Thermodynamics: Experiment and Theory (STET 18)  
Max Planck Institute for the Physics of Complex Systems, Dresden (Germany), 2018

Postponed activities:

1. Workshop "Signatures of Nonequilibrium Fluctuations in Life " I (smr 3446)  
ICTP workshop, postponed to 2023

#### (h) External Grants and Funding

- Project member of SNF Grant *Modelling a desynchronization strategy from the COVID-19 pandemic* CHF 296.250 (275.400 EUR), 2020-2022
- Application ERC starting grant: Step 2 Interview  
Final panel score: A (Ranking range 50%, not selected for funding), 2018
- ICAM funding for workshop "Signatures of Nonequilibrium Fluctuations in Life"  
15.000 USD, awarded in 2019

#### (i) Invited Talks, Lectures, and Seminars

1. *Thermodynamics of Gambling Demons* (Online)  
WOST II - Workshop on Stochastic Thermodynamics  
Santa Fe Institute (United States), 2021
2. *Introduction to Biophysics* (Online)  
5th Biophysics School in Tanzania  
University of Dodoma (Tanzania), 2021
3. *Thermodynamics of Gambling Demons* (Online)  
University of Virginia, Richmond (United States), 2021
4. *Energetics of critical oscillators in active bacterial baths* (Online)  
International Conference on Control of Self-Organizing Nonlinear Systems  
TU Berlin, Berlin (Germany), 2021
5. *Motor de Carnot Browniano: estudiando la energia en la escala microscopica con pinzas opticas* (Online). Universidad del Valle de Guatemala (Guatemala), 2021
6. *Energetics of critical oscillators in active bacterial baths* (Online)  
APS March Meeting (United States), 2021
7. *Resetting in biology* (Online)  
Biosoft Seminar, Tel Aviv University, Tel Aviv (Israel), 2021
8. Martingale theory for stochastic thermodynamics : extrema, stopping times, and gambling  
Nordita, Stockholm (Sweden), 2020
9. *Martingale stochastic thermodynamics* (Online)  
ICTP-SISSA-CECAM Workshop on Molecular Dynamics  
and its Applications to Biological Systems, 2020
10. *Lecithin as a Putative Biodegradable Blocker of SARS-CoV-2* (Online)  
Joint QLS-CMSP Virtual Summer Retreat on Heat, Water, Noise, and Life, 2020
11. *First-passage times: a refreshing view of biophysical fluctuations*  
Department of Physics, University of Zagreb, Zagreb (Croatia), 2020
12. *Heat engines and Carnot efficiency at the nanoscale*

DIPC - Donostia International Physics Centre  
San Sebastian, Spain, 2020

13. *Martingale theory for stochastic thermodynamics*  
XXIV Convegno Nazionale di Fisica Statistica e dei Sistemi Complessi, Parma (Italy), 2019
14. *Martingale theory of stochastic thermodynamics* (Invited Talk)  
Santa Marinella Research Institute, Santa Marinella (Italy), 2019
15. *Stochastic thermodynamics: and emerging, evolving field* (Invited Lecture)  
Workshop on Martingales in Finance and Physics, ICTP, Trieste (Italy), 2019
16. *Experimental construction of a colloidal Carnot engine* (Invited Talk)  
Workshop "Colloids as a Toolbox for Statistical Mechanics", University of Cambridge (UK), 2019
17. *Arrow of Time and Entropy Production in Active Fluctuations*  
Michael Cates Group, University of Cambridge, Cambridge (UK), 2019
18. *Arrow of Time and Entropy Production in Active Fluctuations*  
King's College London, London (UK), 2019
19. *Martingale theory for nonequilibrium thermodynamics*  
Laboratoire Gulliver, ESPCI, Paris (France), 2019
20. *Arrow of time and entropy production in active fluctuations* (Invited Talk)  
Workshop "Why measure entropy production?"  
Princeton Center for Theoretical Sciences, Princeton (United States), 2018
21. *Arrow of Time and Entropy Production in Active Fluctuations* Hudspeth Lab, The Rockefeller University, New York (United States), 2018
22. *Extreme reductions of entropy production in an electronic double dot* (Invited Talk)  
QT60 - Workshop on thermodynamics, thermoelectrics and transport in quantum devices  
Hanasaari Cultural Centre, Espoo (Finland), 2018
23. *Arcsine laws and extreme values in stochastic thermodynamics*  
PICO group, Aalto University, Aalto (Finland), 2018
24. *Arcsine laws and extreme values in stochastic thermodynamics* (Invited Talk)  
CONES 2018 - Conference on Non-Equilibrium Systems  
King's College London, London (UK), 2018
25. *Heat engines and Carnot efficiency at the nanoscale*  
University of Southampton, Southampton (UK), 2018
26. *Martingale theory for nonequilibrium thermodynamics*  
Laboratoire Dieudonne, Universite Cote d'Azur, Nice (France), 2018
27. *Arcsine laws and extreme values in stochastic thermodynamics*  
Advanced Workshop on Nonequilibrium Systems in Physics, Geo sciences, and Life Sciences  
ICTP, Trieste (Italy), 2018
28. *Records of entropy production in a double quantum dot*  
DPG Meeting, Berlin (Germany), 2018
29. *Records of entropy production at the nanoscale*  
Invited QLS Seminar, ICTP, Trieste (Italy), 2018
30. *Generic Properties of Stochastic Entropy Production*  
30th Smoluchowski Symposium  
Collegium Novum, Krakow (Poland), 2017
31. *Brownian Carnot engine\**  
LIQUIDS'17 Liquid Matter Conference  
Cankarjev dom Cultural and Congress Centre, Ljubljana (Slovenia), 2017
32. *Negative records of entropy production: the infimum law*

- FQMT'17 Frontiers of Quantum and Mesoscopic Thermodynamics  
Orea Hotel Pyramida, Prague (Czech Republic), 2017
33. *Martingale theory for nonequilibrium thermodynamics*  
Climate Fluctuations and Non-equilibrium Statistical Mechanics  
Max Planck Institute for the Physics of Complex Systems, Dresden (Germany), 2017
  34. *Negative records of entropy production: the infimum law*  
Dynamics, Thermodynamics and Information Processing in Chemical Networks  
University of Luxembourg (Luxembourg), 2017
  35. *Extreme values of mesoscopic currents in Physics and Biology\**  
DPG Meeting, TU Dresden, Dresden (Germany), 2017
  36. *Brownian Carnot engine\**  
DPG Meeting, TU Dresden, Dresden (Germany), 2017
  37. *Heat engines and Carnot efficiency at the nanoscale* (Colloquium)  
Universität Oldenburg, Oldenburg (Germany), 2017
  38. *Martingale Theory for Nonequilibrium Thermodynamics* (Colloquium)  
Institute for Theoretical Physics Cologne, Cologne (Germany), 2017
  39. *Decision Making and Infima in Physics and Biology*  
Laboratoire de Physico Chimie, Institut Curie, Paris (France), 2017
  40. *Decision Making in the Arrow of Time\**  
DPG Meeting, Universität Regensburg, Regensburg (Germany), 2016
  41. *Thermodynamics of symmetry breaking\**  
Workshop on recent Developments In Non-Equilibrium Physics "Luxembourg out of Equilibrium"  
University of Luxembourg (Luxembourg), 2015
  42. *Thermodynamics of symmetry breaking\**  
XI GISC Workshop  
Universidad Complutense de Madrid, Madrid (Spain), 2014
  43. *Mechanisms of backtrack recovery in RNA polymerases I and II*  
Universidad Politecnica de Madrid, Madrid (Spain), 2014
  44. *Thermodynamics of symmetry breaking*  
Universidad de Granada, Granada (Spain), 2014
  45. *Thermodynamics of symmetry breaking*  
Centre de Recerca Matematica, Bellaterra (Spain), 2014
  46. *Detecting active processes from spontaneous oscillations of Ear Hair Bundles\**  
XI GISC Workshop  
Universidad Carlos III de Madrid, Leganés (Spain), 2013
  47. *Mimicking high-temperature reservoirs for colloidal particles using noisy electric fields\**  
FisEs 2012, IFISC, Palma de Mallorca (Spain), 2012
  48. *Relative entropy as a quantitative measure of irreversibility in non-equilibrium stationary states\**  
II Workshop MODELICO  
Centro de Astrobiología INTA-CSIC, Madrid (Spain), 2010
  49. *Entropy production and time asymmetry in nonequilibrium stationary states*  
International Symposium on Quantum Thermodynamics  
Universität Stuttgart, Stuttgart (Germany), 2010
  50. *Construction of a microscopic Szilard engine*  
Mechanics of Large Molecular Assemblies  
IFISC, Mallorca (Spain), 2010
  51. *Dissipation and information in stochastic processes*

VI GISC Workshop

Universidad Carlos III de Madrid, Leganés (Spain), 2010

52. *Estimating dissipation with single stationary trajectories*

kTlog2: Computing Matters

Toledo (Spain), 2009

(\* = contributed talks)

### (j) Teaching

- 2021-2022 Lectures "Biophysics" (52h)  
ICTP postgraduate diploma program in Quantitative Life Sciences. Trieste, Italy
- 2020-2021 Lectures "Biophysics" (52h)  
ICTP postgraduate diploma program in Quantitative Life Sciences. Trieste, Italy
- 2020-2021 Lectures "Introduzione alla Biofisica" (52h)  
Bachelor of Physics, Università degli studi di Trieste. Trieste, Italy
- 2019-2020 Lectures "Biophysics" (52h)  
ICTP postgraduate diploma program in Quantitative Life Sciences. Trieste, Italy
- 2019-2020 Lectures "Introduzione alla Biofisica" (24h)  
Bachelor of Physics, Università degli studi di Trieste. Trieste, Italy
- 2018-2019 Lectures "Probability Theory" (4h)  
PCS Master Physics of Complex Systems  
SISSA; joint course with Matteo Marsilli. Trieste, Italy
- 2017-2018 Lectures "Theoretical Biophysics" (4h)  
TU Dresden; joint course with Frank Jülicher and Stephan W. Grill. Dresden, Germany
- 2016-2017 Lab Rotation for PhD students (one week), Dresden International PhD Program  
Max Planck Institute for the Physics of Complex Systems. Dresden, Germany
- 2012-2013 Lectures "Physics applied to biology" (20h)  
Faculty of Biology and Geology, UCM; joint course with Luis Dinis. Madrid, Spain
- 2011-2012 Lectures "Physics applied to biology" (20h)  
Faculty of Biology and Geology, UCM; joint course with Luis Dinis. Madrid, Spain

### (k) Supervision of Msc and PhD students, and Postdocs

1. Sarah Loos (Postdoc, Germany, 2021-current)
2. Annwasha Dutta (Postdoc, India, 2020-2021)
3. Roman Belousov (Postdoc, Russia, 2018-2020)
4. Gennaro Tucci (PhD student, Italy, 2019-2022)
5. Pierluigi Muzzeddu (PhD student, Italy, 2021-current)
6. Rita Majumdar (PhD STEP student, India, 2019-current)
7. Samvit Mahapatra (PhD student joint ICTP-RKMVERI, India, 2021-current)
8. Ashwin Gopal (Msc student, India, 2019-2020)
9. Yonathan Sarmiento (Diploma student, Venezuela, 2020-2021)
10. Fahad Kamulegeya (Diploma student, Uganda, 2019-2020)
11. Irem Topal (Visiting summer PhD student, Turkey, 2021)
12. Pedro Harunari (Visiting summer PhD student, Brazil, 2021)
13. Ekaterina Vedenchuk (Visiting summer Msc student, Russia, 2019)
14. Jane Garcia (Visiting summer Msc student, Phillipines, 2019)

## **(l) PhD Committees**

1. Aykut Argun, Universitat Gothemburg, Gothemburg (Sweden), 2021  
Chair of PhD Thesis Committee
2. Nicolas Tizon Escamilla, Universidad de Granada, Granada (Spain), 2019  
Vice-chair of PhD Thesis Committee
3. Priyo S. Pal, Homi Bhabha National Institute, Bhubaneswar (India), 2019  
External referee
4. Ryan Cubero, SISSA, Trieste (Italy), 2018  
Vice-chair of PhD Thesis Committee
5. Angel M Nunez, Universidad Politecnica de Madrid, Madrid (Spain), 2014  
Vice-chair of PhD Thesis Committee

## **(m) Commissions of Trust**

- Regular Scientific Referee of:  
Phys. Rev. Lett., Phys. Rev. X, Phys. Rev. E, Nature Comms., New J. Phys., J. Stat. Mech.,  
J. Stat. Phys., Physica A, J. Chem. Phys., EPL (Distinguished Referee 2017), Eur. Phys. J. B, etc.
- Reviewer of ERC Advanced Grant, since 2019
- Reviewer of FONCYT (Fondo para la Investigación Científica y Tecnológica, Argentina), since 2021
- Member of the ICTP Faculty Board, since 2021
- Scientific Supervisor of ICTP Associates:
  1. Shamik Gupta (RKMVERI, India)
  2. Elena Rufeil (Universidad de Cordoba, Argentina)
  3. Ali Rajabpour (IKIU Qazvin, Iran)
  4. Velimir Ilic (MISASA Nis, Serbia)