

# Curriculum Vitae: Luc Rey-Bellet

## Contact Information

[arXiv:2407.11901](https://arxiv.org/abs/2407.11901)

## Educational History:

- **Ph.D. in Mathematics (1998):** Department of Mathematics, University of Geneva, Geneva, Switzerland. Advisor: *Prof. Jean-Pierre Eckmann*
- **Dipl. Phys. ETHZ (1994):** , Department of Physics, Swiss Federal Institute of Technology (ETHZ), Zurich, Switzerland. Advisor: *Prof. Jürg Fröhlich*

## Professional appointments:

- **Research Fellow:** Rutgers University 1998-1999
- **Whyburn Instructor:** University of Virginia 1999-2002
- **Assistant Professor:** University of Massachusetts 2002-2008
- **Associate Professor:** University of Massachusetts 2008-2013
- **Visiting Professor:** University of Crete 2011 (Spring semester)
- **Professor:** University of Massachusetts since 2013

## Selected recent service

- Editorial board of Journal of Statistical Physics 2013–2018
- Organizer of the Oberwolfach seminar on Markov processes, 2011
- Organizer of the Conference in honor of J.P. Eckmann 75th birthday, 2022
- Organizer of ICERM Workshop on Optimal Transport and Machine Learning, 2023

## Grant funding

- FNRS Bourse de jeune chercheur 1999 (SFr 45k)
- NSF Grant 2003 (3 year, PI, \$101K)
- NSF Grant 2006 (3 year, PI, \$106K)
- NSF Grant 2011 (3 Year, PI, \$99K)
- NSF Grant 2015 (3 year, PI (with 1 Co-PI) \$280K)
- DOE Grant 2016 (3 year, co-PI (with 4 PI) \$900K)
- AFOSR Grant 2019 (3 year, co-PI (with 2 PIs) \$900 K)
- NSF Grant 2020 (3 year, PI (with 1 Co-PI) \$ 370K)
- AFOSR Grant 2022 (4 year (with 2 PIs) \$1.950M)
- NSF Grant 2023 (3 year, PI (with 1 Co-PI) \$300K)

## Graduate students and postdoctoral advising:

- Dimitrios Tsagkarogiannis (Graduation 2006, University of L'Aquila)
- Michael Diehl (Graduation 2008, Endicott College)
- Sasanka Are (Graduation 2009, Cerner Corporation)
- Sung-Ha Hwang (Graduation 2011, KAIST, Korea)
- Yannis Pantazis (Postdoctoral fellow, 2012-2013, and 2014-2015, Forth Crete)
- Kostis Gourgoulis (Graduation 2017, JP Morgan)
- Georgios Arampatzis (Postdoctoral fellow, 2014-2015, University of Crete)
- Jinchao Feng (Graduation 2019, John Hopkins University )
- Jie Wang (Graduation 2019, Discover)
- Jeremiah Birrell (Postdoctoral fellow, 2017-2022, Texas State University)
- Pangioti Birmpa (Postdoctoral fellow, 2018-2022, Heriott-Watt University)
- Hyemin Gu (Graduate Student since 2021 )
- Benjamin Zhang (Postdoctoral fellow, 2022-2024, Brown University)
- Ziyu Chen (Postdoctoral fellow, 2022-2025)

## Publications

- Hyemin Gu, Markos A. Katsoulakis, Luc Rey-Bellet, and Benjamin J. Zhang. **Combining Wasserstein-1 and Wasserstein-2 proximals: robust manifold learning via well-posed generative flows.** Submitted.  
arXiv:2407.11901

Jeremiah Birrell, Markos A. Katsoulakis, Luc Rey-Bellet, Benjamin Zhang, and Wei Zhu.  
**Nonlinear denoising score matching for enhanced learning of structured distributions.**

Submitted.  
arXiv:2405.15625

Ziyu Chen, Hyemin Gu, Markos A. Katsoulakis, Luc Rey-Bellet, and Wei Zhu.  
**Learning heavy-tailed distributions with Wasserstein-proximal-regularized - divergences.** Submitted.  
arXiv:2405.13962

Ziyu Chen, Markos A. Katsoulakis, Luc Rey-Bellet, and Wei Zhu.  
**Statistical Guarantees of Group-Invariant GANs.** Submitted.  
arXiv:2305.13517

Ziyu Chen, Markos A. Katsoulakis, Luc Rey-Bellet, and Wei Zhu.  
**Sample Complexity of Probability Divergences under Group Symmetry.**  
Proceedings of 40th International Conference on Machine Learning, PMLR 202 (2023)  
pp. 4713-4734.  
Online Version   Reprint in PDF (including supplementary materials)

Hyemin Gu, Panagioti Birmpa, Yannis Pantazis, Luc Rey-Bellet, and Markos A. Katsoulakis.  
**Lipschitz-regularized gradient flows and generative particle algorithms for high-dimensional scarce data.**  
To appear in Siam Journal on Mathematics of Data Science (2024).  
arXiv:2210.17230

Jeremiah Birrell, Paul Dupuis, Markos Katsoulakis, Yannis Pantazis, and Luc Rey-Bellet.  
**Function-space regularized Rényi divergences.**  
Proceedings of The Eleventh International Conference on Learning Representations (ICLR 2023).  
Poster and Slides   Open review   Reprint in PDF

Jeremiah Birrell, Markos Katsoulakis, Luc Rey-Bellet, and Wei Zu.  
Structure-preserving GANs.  
Proceedings of the 39th International Conference on Machine Learning, PMLR 162 (2022),  
pp.1982-2020.  
Online Version   Reprint in PDF (including supplementary materials)

Panagioti Birmpa, Jinchao Feng, Markos Katsoulakis, and Luc Rey-Bellet.  
Model Uncertainty and Correctability for Directed Graphical Models.  
SIAM/ASA Journal on Uncertainty Quantification 10 (2022), no.4, pp 1461–1512.

DOI:10.1137/21M1434453   Reprint in PDF

Jeremiah Birrell, Paul Dupuis, Markos Katsoulakis, Yannis Pantazis, and Luc Rey-Bellet.  
(f,Γ)-Divergences: Interpolating between f-Divergences and Integral Probability Metrics.  
Journal of Machine Learning Research 23 (2022), paper 39, pp.1–70.  
Online Version   Reprint in PDF

Jeremiah Birrell, Paul Dupuis, Markos A. Katsoulakis, Luc Rey-Bellet, and Jie Wang.  
A variational formula for Rényi divergences.  
SIAM Journal on Mathematics of Data Science 3 (2021), no. 4, pp. 1093-1116  
DOI: 10.1137/20M1368926   Reprint in PDF

Jeremiah Birrell, Paul Dupuis, Markos A. Katsoulakis, Luc Rey-Bellet, and Jie Wang.  
Distributional robustness and uncertainty quantification for rare events.  
Preprint.  
arXiv:1911.09580   Preprint in PDF

Sung-Ha Hwang and Luc Rey-Bellet.  
Positive feedback in coordination games: stochastic evolutionary dynamics and the logit choice rule.  
Games and Economic Behavior 126 (2021), pp. 355-373  
DOI: 10.1016/j.geb.2021.01.003   Reprint in PDF   Supplementary Materials

Jeremiah Birrell, Markos Katsoulakis, and Luc Rey-Bellet.  
Quantification of model uncertainty on path-space via goal-oriented relative entropy.  
ESAIM: Mathematical Modeling and Numerical Analysis 55 (2021), no.1, pp. 131-169.  
DOI: 10.1051/m2an/2020070   Reprint in PDF

Jeremiah Birrell and Luc Rey-Bellet.  
Concentration inequalities and performance guarantees for hypocoercive MCMC samplers.  
Preprint. arXiv:1907.11973   Preprint in PDF

Paul Dupuis, Markos Katsoulakis, Yannis Pantazis, and Luc Rey-Bellet.  
Sensitivity analysis for rare events based on Rényi divergence.  
The Annals of Applied Probability, 30 (2020), no.4, pp. 1507-1533.  
DOI:10.1214/19-AAP1468   Reprint in PDF

Jeremiah Birrell and Luc Rey-Bellet.  
Uncertainty quantification for Markov processes via variational principles and functional

inequalities.

SIAM/ASA Journal on Uncertainty Quantification, 8 (2020), no. 2, pp. 539–572.

DOI: 10.1137/19M1237429 Reprint in PDF

Konstantinos Gourgoulis, Markos Katsoulakis, Luc Rey-Bellet, and Jie Wang.

How biased is your model? Concentration inequalities, information and model bias. IEEE Transactions on Information Theory 66 (2020), no.5, pp. 3079–3097.

DOI: 10.1109/TIT.2020.2977067 Reprint in PDF

Sung-Ha Hwang and Luc Rey-Bellet.

Simple characterizations of potential games and zero-sum equivalent games. Journal of Economic Theory and Econometrics, 31 (2020), pp. 1–13.

Online version Reprint in PDF

Sung-Ha Hwang and Luc Rey-Bellet.

Strategic decompositions of normal form games: potential games and zero-sum games.

Games and Economic Behavior 122, (2020), pp. 370–390.

DOI: 10.1016/j.geb.2020.05.003 Reprint in PDF file Supplementary Materials

Mark Demers, Luc Rey-Bellet, and Hongkun Zhang.

Fluctuations of the entropy production for the Lorentz gas under small external forces.

Communications in Mathematical Physics 363 (2018), no. 2, pp. 699–740.

DOI: 10.1007/s00220-018-3228-3 MR3851827 Reprint in PDF

Noé Cuneo, Jean-Pierre Eckmann, Martin Hairer, and Luc Rey-Bellet.

Non-equilibrium steady states for networks of oscillators.

Electronic Journal of Probability 23 (2018), paper no. 55, 28 pp.

DOI: 10.1214/18-EJP177 MR3814249 Reprint in PDF

Markos Katsoulakis, Luc Rey-Bellet, and Jie Wang.

Scalable information inequalities for uncertainty quantification.

Journal of Computational Physics 336 (2017), pp. 513–545.

DOI: 10.1016/j.jcp.2017.02.020 Reprint in PDF

Konstantinos Gourgoulis, Markos Katsoulakis, and Luc Rey-Bellet.

Information criteria for quantifying loss of reversibility in parallelized KMC.

Journal of Computational Physics 328 (2017), pp. 438–454.

DOI: 10.1016/j.jcp.2016.10.031 MR3571894 Reprint in PDF

- Eric Hall, Markos Katsoulakis, and Luc Rey-Bellet.  
 Uncertainty quantification for generalized Langevin dynamics.  
 Journal of Chemical Physics 145 (2016), 224108.  
 DOI: 10.1063/1.4971433 Reprint in PDF
- Konstantinos Spiliopoulos and Luc Rey-Bellet.  
 Improving the convergence of reversible samplers.  
 Journal of Statistical Physics 164 (2016), no.3, 472–494.  
 DOI: 10.1007/s10955-016-1565-1 MR3519206 Reprint in PDF
- Georgios Arampatzis, Markos Katsoulakis, and Luc Rey-Bellet.  
 Efficient estimators for likelihood ratio sensitivity indices of complex stochastic dynamics.  
 Journal of Chemical Physics 144 (2016), 104107.  
 DOI: 10.1063/1.4943388 Reprint in PDF
- Konstantinos Gourgoulis, Markos Katsoulakis, and Luc Rey-Bellet.  
 Information metrics for long-time errors in splitting schemes for stochastic dynamics and parallel kinetic Monte Carlo.  
 SIAM Journal on Scientific Computing 38 (2016), no. 6, pp. A3808–A3832.  
 DOI: 10.1137/15M1047271 MR3582415 Reprint in PDF
- Konstantinos Spiliopoulos and Luc Rey-Bellet.  
 Variance reduction for irreversible Langevin samplers and diffusion on graphs.  
 Electronic Communications in Probability 20 (2015), no. 15, 16pp.  
 DOI: 10.1214/ECP.v20-3855 MR3314650 Reprint in PDF
- Konstantinos Spiliopoulos and Luc Rey-Bellet.  
 Irreversible Langevin samplers and variance reduction: a large deviation approach.  
 Nonlinearity 28 (2015), no.7, pp. 2081–2103.  
 DOI: 10.1088/0951-7715/28/7/2081 MR3366637 Reprint in PDF
- Markos Katsoulakis, Yannis Pantazis, and Luc Rey-Bellet.  
 Measuring the irreversibility of numerical schemes for reversible stochastic differential equations.  
 ESAIM: Mathematical Modelling and Numerical Analysis 48 (2014), no.5, pp. 1351–1379.  
 DOI: 10.1051/m2an/2013142 MR3264357 Reprint in PDF .
- M. Katsoulakis, P. Plecháč, Luc Rey-Bellet, and D. Tsagkarogiannis.  
 Coarse-graining schemes for stochastic lattice systems with short and long-range interactions.  
 Mathematics of Computation 83 (2014), no.288, pp. 1757–1793.  
 DOI: 10.1090/S0025-5718-2014-02806-8 MR3194129 Reprint in PDF
- Sung-Ha Hwang, Luc Rey-Bellet, and Markos Katsoulakis.  
 Deterministic equations for stochastic spatial evolutionary games.  
 Theoretical Economics 8 (2013), no.3, pp. 829–874.  
 DOI: 10.3982/TE829 MR3106962 Reprint in PDF

- Andrea Nahmod, Hiro Oh, Luc Rey-Bellet, and Gigliola Staffilani.  
Invariant weighted Wiener measures and almost sure global well-posedness for the periodic derivative NLS.  
Journal of the European Mathematical Society 14 (2012), no.4, pp. 1275–1330.  
DOI: 10.4171/JEMS/333 MR2928851 Reprint in PDF
- Sung-Ha Hwang and Luc Rey-Bellet.  
Decompositions of two player games: potential, zero-sum, and stable games.  
Unpublished (2011).  
arXiv:1106.3552 .
- Andrea Nahmod, Luc Rey-Bellet, Scott Sheffield, and Gigliola Staffilani.  
Absolute continuity of Brownian bridges under certain gauge transformations.  
Mathematical Research Letters 18 (2011), no.5, pp. 875–887.  
DOI: 10.4310/MRL.2011.v18.n5.a6 MR2875861 Reprint in PDF
- Yoshiko Ogata and Luc Rey-Bellet.  
Ruelle-Lanford functions and large deviations for asymptotically decoupled quantum spin systems.  
Reviews in Mathematical Physics 23 (2011), no.2, pp. 211–232.  
DOI: 10.1142/S0129055X11004291 MR2786227 Reprint in PDF
- Vojkan Jaksic, Claude-Alain Pillet, and Luc Rey-Bellet.  
Entropic fluctuations in statistical mechanics I. Classical dynamical systems.  
Nonlinearity 24 (2011), no.3, pp. 699–763.  
DOI: 10.1088/0951-7715/24/3/003 MR2765481 Reprint in PDF
- Wojciech De Roeck, Christian Maes, Karel Netočný, and Luc Rey-Bellet.  
A note on the non-commutative Laplace-Varadhan integral lemma,  
Reviews in Mathematical Physics 22 (2010), no.7, pp. 839–858.  
DOI: 10.1142/S0129055X10004089 MR2673696 Reprint in PDF
- Sasanka Are, Markos Katsoulakis, Petr Plecháč, and Luc Rey-Bellet.  
Multi-body interactions in coarse-graining schemes of extended systems.  
SIAM Journal on Scientific Computing 31 (2008/2009), no.2, pp. 987–1015.  
DOI: 10.1137/080713276 MR2466145 Reprint in PDF
- Markos Katsoulakis, Petr Plecháč, and Luc Rey-Bellet.  
Numerical and statistical methods for the coarse-graining of many-particle stochastic systems.  
Journal of Scientific Computing 37 (2008), no.1, pp. 43–71.  
DOI: 10.1007/s10915-008-9216-6 MR2442973 Reprint in PDF

Lai-Sang Young and Luc Rey-Bellet.

Large deviations in nonuniformly hyperbolic dynamical systems. *Ergodic Theory and Dynamical Systems* 28 (2008), no.2, pp. 587–612.

DOI:10.1017/S0143385707000478 MR2408394 Reprint in PDF

Markos Katsoulakis, Petr Plecháč, Luc Rey-Bellet, and Dimitrios Tsagkarogiannis.

Mathematical strategies in the coarse-graining of extensive systems: error quantification and adaptivity.

*Journal of Non Newtonian Fluid Mechanics* 152 (2008), pp. 101–112.

DOI: 10.1016/j.jnnfm.2007.05.005 Reprint in PDF

Markos Katsoulakis, Petr Plecháč, Luc Rey-Bellet, and Dimitrios Tsagkarogiannis.

Coarse-graining schemes and a posteriori error estimates for stochastic lattice systems.

*ESAIM: Mathematical Modelling and Numerical Analysis* 41 (2007), no.3, pp. 627–660.

DOI: 10.1051/m2an:2007032 MR2355714 Reprint in PDF

Federico Bonetto and Luc Rey-Bellet.

Fourier Law.

In: *Encyclopedia of Mathematical Physics*. J.-P. Francoise, G. L. Naber, S.T. Tsou (Eds.), Elsevier 2006, pp. 374–379.

Reprint in PDF

Luc Rey-Bellet.

Open Classical Systems.

In: *Quantum Open Systems II. The Markovian approach*. Stéphane Attal, Alain Joye, Claude-Alain Pillet (Eds.), *Lecture Notes in Mathematics* 1881, Berlin: Springer, 2006, pp. 41–78.

DOI: 10.1007/3-540-33966-3\_2 MR2248987 Reprint in PDF

Luc Rey-Bellet.

Ergodic Properties of Markov Processes.

In: *Quantum Open Systems II. The Markovian approach*. Stéphane Attal, Alain Joye, Claude-Alain Pillet (Eds.), *Lecture Notes in Mathematics* 1881, Berlin: Springer, 2006, pp. 1–39.

DOI:10.1007/3-540-33966-3\_1 MR2248986 Reprint in PDF

Luc Rey-Bellet.

Nonequilibrium statistical mechanics of open classical systems.

In: *XIVth International Conference on Mathematical Physics*, Lisbon, Portugal, 28 July – 2 August 2003, World Scientific 2006, pp. 447–454

DOI: 10.1142/9789812704016\_0043 MR2227858 PDF file

Marco Lenci and Luc Rey-Bellet.

Large deviations in quantum lattice systems: one phase region.



Journal of Statistical Physics 119 (2005), no. 3-4, pp. 715–746.  
DOI: 10.1007/s10955-005-3015-3 MR2151220 Reprint in PDF

Lawrence E. Thomas and Luc Rey-Bellet.

Low regularity solutions to a gently stochastic nonlinear wave equation in nonequilibrium statistical mechanics.

Stochastic Processes and their Applications 115 (2005), no.6, pp. 1041–1059. (2005).

DOI: 10.1016/j.spa.2005.02.003 MR2138813 Reprint in PDF

Luc Rey-Bellet.

Statistical mechanics of anharmonic lattices.

In: Advances in Differential Equations and Mathematical Physics, AMS Contemporary Mathematics Series 327 (2003), pp. 283–298.

DOI: MR1991548 Reprint in PDF

Lawrence E. Thomas and Luc Rey-Bellet.

Fluctuations of the entropy production in anharmonic chains,

Annales Henri Poincaré 3 (2002), no.3, pp. 483–502.

DOI: 10.1007/s00023-002-8625-6 MR1915300 Reprint in PDF

Lawrence E. Thomas and Luc Rey-Bellet.

Exponential convergence to non-equilibrium stationary states in classical statistical mechanics.

Communications in Mathematical Physics 225 (2002), no.1, pp. 305–329.

DOI: 10.1007/s002200100583 MR1889227 Reprint in PDF

Jürg Fröhlich, Luc Rey-Bellet, and Daniel Ueltschi.

Quantum lattice systems at intermediate temperature,

Communications in Mathematical Physics 224 (2001), no. 1, pp. 33–63.

DOI: 10.1007/s002200100530 MR1869003 Reprint in PDF

Federico Bonetto, Joel Lebowitz, and Luc Rey-Bellet.

Fourier Law: A challenge to theorists.

In: Mathematical Physics 2000, A. Fokas, A. Grigoryan, T. Kibble, and B. Zegarlinski (Eds.)

Imperial College Press, London 2000, pp. 128–150.

DOI:10.1142/9781848160224\_0008 MR1773043 Reprint in PDF

Lawrence E. Thomas and Luc Rey-Bellet.

Asymptotic behavior of thermal non-equilibrium steady states for a driven chain of anharmonic oscillators.

Communications in Mathematical Physics 215 (2000), no.1, pp. 1–24.

DOI: 10.1007/s002200000285 MR1799873 Reprint in PDF

Jean-Pierre Eckmann, Claude-Alain Pillet, and Luc Rey-Bellet.  
Entropy production in non-linear, thermally driven Hamiltonian systems.  
Journal of Statistical Physics 95 (1999), no. 1-2, pp. 305–331.  
DOI:10.1023/A:1004537730090 MR1705589 Reprint in PDF

Jean-Pierre Eckmann, Claude-Alain Pillet, and Luc Rey-Bellet.  
Non-equilibrium statistical mechanics of anharmonic chains coupled to two heat baths at different temperatures.  
Communications in Mathematical Physics 201 (1999), no. 3, pp. 657–697.  
DOI: 10.1007/s002200050572 MR1685893 Reprint in PDF

Jürg Fröhlich and Luc Rey-Bellet.  
Low-temperature phase diagrams of quantum lattice systems. III. Examples.  
Helvetica Physica Acta 69 (1996), 5-6, pp. 821–849.  
DOI: 10.5169/seals-116980 MR1428029 Reprint in PDF

Nilanjana Datta, Roberto Fernandez, Jürg Fröhlich, and Luc Rey-Bellet.  
Low-temperature phase diagrams of quantum lattice systems. II. Convergent perturbation expansions and stability in systems with infinite degeneracy.  
Helvetica Physica Acta 69 (1996), 5-6, pp. 752–820.  
DOI: 10.5169/seals-116979 MR1428028 Reprint in PDF

## **Publications**

Nilanjana Datta, Roberto Fernandez, Jürg Fröhlich, and Luc Rey-Bellet, Low-temperature phase diagrams of quantum lattice systems. II. Convergent perturbation expansions and stability in systems with infinite degeneracy, *Helvetica Physica Acta* 69 (1996), 5-6, pp. 752–820.

Jürg Fröhlich and Luc Rey-Bellet, Low-temperature phase diagrams of quantum lattice systems. III. Examples, *Helvetica Physica Acta* 69 (1996), 5-6, pp. 821–849.

Jean-Pierre Eckmann, Claude-Alain Pillet, and Luc Rey-Bellet, Non-equilibrium statistical mechanics of anharmonic chains coupled to two heat baths at different temperatures, *Communications in Mathematical Physics* 201 (1999), no. 3, pp. 657–697.

Jean-Pierre Eckmann, Claude-Alain Pillet, and Luc Rey-Bellet, Entropy production in non-linear, thermally driven Hamiltonian systems, *Journal of Statistical Physics* 95 (1999), no. 1-2, pp. 305–331.

- Lawrence E. Thomas and Luc Rey-Bellet, Asymptotic behavior of thermal non-equilibrium steady states for a driven chain of anharmonic oscillators, *Communications in Mathematical Physics* 215 (2000), no.1, pp. 1–24.
- Federico Bonetto, Joel Lebowitz, and Luc Rey-Bellet, Fourier Law: A challenge to theorists, In: *Mathematical Physics 2000*, A. Fokas, A. Grigoryan, T. Kibble, and B. Zegarlinski (Eds.) Imperial College Press, London 2000, pp. 128–150.
- Jürg Fröhlich, Luc Rey-Bellet, and Daniel Ueltschi, Quantum lattice systems at intermediate temperature, *Communications in Mathematical Physics* 224 (2001), no. 1, pp. 33–63.
- Lawrence E. Thomas and Luc Rey-Bellet, Exponential convergence to non-equilibrium stationary states in classical statistical mechanics, *Communications in Mathematical Physics* 225 (2002), no.1, pp. 305–329.
- Lawrence E. Thomas and Luc Rey-Bellet, Fluctuations of the entropy production in anharmonic chains, *Annales Henri Poincaré* 3 (2002), no.3, pp. 483–502.
- Luc Rey-Bellet Statistical mechanics of anharmonic lattices, In: *Advances in Differential Equations and Mathematical Physics*, AMS Contemporary Mathematics Series 327 (2003), pp. 283–298.
- Lawrence E. Thomas and Luc Rey-Bellet, Low regularity solutions to a gently stochastic nonlinear wave equation in nonequilibrium statistical mechanics, *Stochastic Processes and their Applications* 115 (2005), no.6, pp. 1041–1059. (2005).
- Marco Lenci and Luc Rey-Bellet, Large deviations in quantum lattice systems: one phase region, *Journal of Statistical Physics* 119 (2005), no. 3-4, pp. 715–746.
- Luc Rey-Bellet, Nonequilibrium statistical mechanics of open classical systems, In: *XIVth International Conference on Mathematical Physics*, Lisbon, Portugal, 28 July – 2 August 2003, World Scientific 2006, pp. 447–454
- Luc Rey-Bellet Ergodic Properties of Markov Processes, In: *Quantum Open Systems II. The Markovian approach*. Stéphane Attal, Alain Joye, Claude-Alain Pillet (Eds.), *Lecture Notes in Mathematics* 1881, Berlin: Ser, 2006, pp. 1–39.
- Luc Rey-Bellet, Open Classical Systems, In: *Quantum Open Systems II. The Markovian approach*. Stéphane Attal, Alain Joye, Claude-Alain Pillet (Eds.), *Lecture Notes in Mathematics* 1881, Berlin: Springer, 2006, pp. 41–78.
- Federico Bonetto and Luc Rey-Bellet, Fourier Law, In: *Encyclopedia of Mathematical Physics*. J.-P. Francoise, G. L. Naber, S.T. Tsou (Eds.), Elsevier 2006, pp. 374–379.
- Markos Katsoulakis, Petr Plechač, Luc Rey-Bellet, and Dimitrios Tsagkarogiannis, Coarse-graining schemes and a posteriori error estimates for stochastic lattice systems, *ESAIM: Mathematical Modelling and Numerical Analysis* 41 (2007), no.3, pp. 627–660.

- Markos Katsoulakis, Petr Plechač, Luc Rey-Bellet, and Dimitrios Tsagkarogiannis, Mathematical strategies in the coarse-graining of extensive systems: error quantification and adaptivity, *Journal of Non Newtonian Fluid Mechanics* 152 (2008), pp. 101–112.
- Lai-Sang Young and Luc Rey-Bellet, Large deviations in nonuniformly hyperbolic dynamical systems, *Ergodic Theory and Dynamical Systems* 28 (2008), no.2, pp. 587–612.
- Markos Katsoulakis, Petr Plechac, and Luc Rey-Bellet, Numerical and statistical methods for the coarse-graining of many-particle stochastic systems, *Journal of Scientific Computing* 37 (2008), no.1, pp. 43–71.
- Sasanka Are, Markos Katsoulakis, Petr Plechač, and Luc Rey-Bellet, Multi-body interactions in coarse-graining schemes of extended systems, *SIAM Journal on Scientific Computing* 31 (2008/2009), no.2, pp. 987–1015.
- Wojciech De Roeck, Christian Maes, Karel Netočný, and Luc Rey-Bellet, A note on the non-commutative Laplace-Varadhan integral lemma, *Reviews in Mathematical Physics* 22 (2010), no.7, pp. 839–858.
- Vojkan Jaksic, Claude-Alain Pillet, and Luc Rey-Bellet, Entropic fluctuations in statistical mechanics I. Classical dynamical systems, *Nonlinearity* 24 (2011), no.3, pp. 699–763.
- Yoshiko Ogata and Luc Rey-Bellet, Ruelle-Lanford functions and large deviations for asymptotically decoupled quantum spin systems, *Reviews in Mathematical Physics* 23 (2011), no.2, pp. 211–232.
- Andrea Nahmod, Luc Rey-Bellet, Scott Sheffield, and Gigliola Staffilani, Absolute continuity of Brownian bridges under certain gauge transformations, *Mathematical Research Letters* 18 (2011), no.5, pp. 875–887.
- Sung-Ha Hwang and Luc Rey-Bellet, Decompositions of two player games: potential, zero-sum, and stable games, Unpublished (2011).
- Andrea Nahmod, Hiro Oh, Luc Rey-Bellet, and Gigliola Staffilani, Invariant weighted Wiener measures and almost sure global well-posedness for the periodic derivative NLS, *Journal of the European Mathematical Society* 14 (2012), no.4, pp. 1275–1330.
- Sung-Ha Hwang, Luc Rey-Bellet, and Markos Katsoulakis, Deterministic equations for stochastic spatial evolutionary games, *Theoretical Economics* 8 (2013), no.3, pp. 829–874.
- M. Katsoulakis, P. Plechač, Luc Rey-Bellet, and D. Tsagkarogiannis, Coarse-graining schemes for stochastic lattice systems with short and long-range interactions, *Mathematics of Computation* 83 (2014), no.288, pp. 1757–1793.
- Markos Katsoulakis, Yannis Pantazis, and Luc Rey-Bellet, Measuring the irreversibility of numerical schemes for reversible stochastic differential equations, *ESAIM: Mathematical Modelling and Numerical Analysis* 48 (2014), no.5, pp. 1351–1379.

- Konstantinos Spiliopoulos and Luc Rey-Bellet, Irreversible Langevin samplers and variance reduction: a large deviation approach, *Nonlinearity* 28 (2015), no.7, pp. 2081–2103.
- Konstantinos Spiliopoulos and Luc Rey-Bellet, Variance reduction for irreversible Langevin samplers and diffusion on graphs, *Electronic Communications in Probability* 20 (2015), no. 15, 16pp.
- Konstantinos Gourgoulis, Markos Katsoulakis, and Luc Rey-Bellet, Information metrics for long-time errors in splitting schemes for stochastic dynamics and parallel kinetic Monte Carlo, *SIAM Journal on Scientific Computing* 38 (2016), no. 6, pp. A3808–A3832.
- Georgios Arampatzis, Markos Katsoulakis, and Luc Rey-Bellet, Efficient estimators for likelihood ratio sensitivity indices of complex stochastic dynamics, *Journal of Chemical Physics* 144 (2016), 104107.
- Konstantinos Spiliopoulos and Luc Rey-Bellet, Improving the convergence of reversible samplers, *Journal of Statistical Physics* 164 (2016), no.3, 472–494.
- Eric Hall, Markos Katsoulakis, and Luc Rey-Bellet, Uncertainty quantification for generalized Langevin dynamics, *Journal of Chemical Physics* 145 (2016), 224108.
- Konstantinos Gourgoulis, Markos Katsoulakis, and Luc Rey-Bellet, Information criteria for quantifying loss of reversibility in parallelized KMC, *Journal of Computational Physics* 328 (2017), pp. 438–454.
- Markos Katsoulakis, Luc Rey-Bellet, and Jie Wang, Scalable information inequalities for uncertainty quantification, *Journal of Computational Physics* 336 (2017), pp. 513–545.
- Noé Cuneo, Jean-Pierre Eckmann, Martin Hairer, and Luc Rey-Bellet, Non-equilibrium steady states for networks of oscillators, *Electronic Journal of Probability* 23 (2018), paper no. 55, 28 pp.
- Mark Demers, Luc Rey-Bellet, and Hongkun Zhang, Fluctuations of the entropy production for the Lorentz gas under small external forces, *Communications in Mathematical Physics* 363 (2018), no. 2, pp. 699–740.
- Sung-Ha Hwang and Luc Rey-Bellet, Strategic decompositions of normal form games: potential games and zero-sum games, *Games and Economic Behavior* 122, (2020), pp. 370–390.
- Sung-Ha Hwang and Luc Rey-Bellet, Simple characterizations of potential games and zero-sum equivalent games, *Journal of Economic Theory and Econometrics*, 31 (2020), pp. 1–13.
- Konstantinos Gourgoulis, Markos Katsoulakis, Luc Rey-Bellet, and Jie Wang, How biased is your model? Concentration inequalities, information and model bias, *IEEE Transactions on Information Theory* 66 (2020), no.5, pp. 3079–3097.
- Jeremiah Birrell and Luc Rey-Bellet, Uncertainty quantification for Markov processes via variational principles and functional inequalities, *SIAM/ASA Journal on Uncertainty Quantification*, 8 (2020), no. 2, pp. 539–572.

Paul Dupuis, Markos Katsoulakis, Yannis Pantazis, and Luc Rey-Bellet, Sensitivity analysis for rare events based on Rényi divergence, *The Annals of Applied Probability*, 30 (2020), no.4, pp. 1507-1533.

Jeremiah Birrell and Luc Rey-Bellet Concentration inequalities and performance guarantees for hypocoercive MCMC samplers, Preprint.

Jeremiah Birrell, Markos Katsoulakis, and Luc Rey-Bellet, Quantification of model uncertainty on path-space via goal-oriented relative entropy, *ESAIM: Mathematical Modeling and Numerical Analysis* 55 (2021), no.1, pp. 131-169.

Sung-Ha Hwang and Luc Rey-Bellet, Positive feedback in coordination games: stochastic evolutionary dynamics and the logit choice rule, *Games and Economic Behavior* 126 (2021), pp. 355-373.

Jeremiah Birrell, Paul Dupuis, Markos A. Katsoulakis, Luc Rey-Bellet, and Jie Wang, Distributional robustness and uncertainty quantification for rare events, Preprint.

Jeremiah Birrell, Paul Dupuis, Markos A. Katsoulakis, Luc Rey-Bellet, and Jie Wang, A variational formula for Rényi divergences, *SIAM Journal on Mathematics of Data Science* 3 (2021), no. 4, pp. 1093-1116

Jeremiah Birrell, Paul Dupuis, Markos Katsoulakis, Yannis Pantazis, and Luc Rey-Bellet,  $(f, \Gamma)$ -Divergences: Interpolating between  $f$ -Divergences and Integral Probability Metrics, *Journal of Machine Learning Research* 23 (2022), paper 39, pp.1–70.

Panagiota Birmpa, Jinchao Feng, Markos Katsoulakis and Luc Rey-Bellet, Model Uncertainty and Correctability for Directed Graphical Models, *SIAM/ASA Journal on Uncertainty Quantification* 10 (2022), no.4, pp 1461–1512.

Jeremiah Birrell, Markos Katsoulakis, Luc Rey-Bellet, Wei Zu Structure-preserving GANs, *Proceedings of the 39th International Conference on Machine Learning*, PMLR 162 (2022) pp.1982-2020.

Jeremiah Birrell, Paul Dupuis, Markos Katsoulakis, Yannis Pantazis, Luc Rey-Bellet Function-space regularized Rényi divergences. *Proceedings of The Eleventh International Conference on Learning Representations (ICLR 2023)*.

Hyemin Gu, Panagiota Birmpa, Yannis Pantazis, Luc Rey-Bellet, and Markos A. Katsoulakis, *Lipschitz-regularized gradient flows and generative particle algorithms for high-dimensional scarce data*, Submitted.

Ziyu Chen, Markos A. Katsoulakis, Luc Rey-Bellet, and Wei Zhu, *Sample Complexity of Probability Divergences under Group Symmetry*, Submitted

Ziyu Chen, Markos A. Katsoulakis, Luc Rey-Bellet, and Wei Zhu, *Statistical Guarantees of Group-Invariant GANs*, Submitted.

## Invited talks

- Journées semi-classiques 1998, Grenoble, February 1998
- Statphys 20, Paris, July 1998
- 80th Statistical mechanics conference, Rutgers University, December 1998
- Non equilibrium statistical mechanics, Schrodinger Institute, February 1999
- The 2002 UAB International conference mathematical physics, March 2002
- Workshop on Fokker-Planck equations, Rennes, France, February 2003
- ODYN-II, Probability and statistical mechanics, CIRM, Marseilles, March 2003
- 89th Statistical mechanics conference, Rutgers university, May 2003
- Summer school on open quantum systems, Grenoble, July 2003
- International congress of mathematical physics, ICMP 2003, Lisbon, August 2003
- Young researcher symposium, Lisbon, July 2003
- Workshop on dynamics and statistical mechanics, CRM, Montreal, August 2004
- SIAM conference on applications of dynamical systems, Snowbird, May 2005
- International congress on the applications of mathematics, Santiago, March 2006
- Workshop on statistical mechanics, CPT-CNRS, Marseilles, July 2006
- 96th Statistical mechanics Conference, Rutgers University, December 2006
- Workshop on nonequilibrium statistical mechanics, Vienna, June 2008
- Workshop on stochastic dynamical systems, Bielefeld, November 2008
- Arizona school of analysis with applications I, University of Arizona, March 2009
- NORDITA Stockholm, Multiscale modeling and simulation in science, November 2009
- SAMSI, Theory and qualitative behavior of stochastic dynamics, February 2010
- Indam meeting, Corinaldo, Hyperbolic dynamical systems in the sciences, June 2010
- SIAM conference on nonlinear waves and coherent structures, August 2010
- Oberwolfach seminar on ergodic theory of Markov processes, October 2010
- 105th Statistical mechanics Conference, Rutgers University, May 2011
- FRG workshop on quantum spin systems, Harvard University, May 2011
- Workshop on Coarse-graining of many-body systems. Heraklion, June 2011
- ENUMATH conference. September 2011
- Three hours course on statistical mechanics), Ecole des Ponts, September 2011
- SIAM conference on material sciences, Philadelphia, June 2013
- SPA conference (Stochastic processes and applications), Boulder, August 2013
- AMS sectional meeting, Session on dynamical systems. Saint Louis, October 2013
- Randomness and Long-Time Dynamics, Radcliffe Institute, November 2014
- CIRM Workshop on Averaging and Homogenization, Marseille, May 2015
- CRiSM Workshop on Non-Reversible Markov Chains, Warwick, September 2015
- Meeting of the Canadian Mathematical Society, Montreal, December 2015
- 114th Statistical Mechanics Conference, Rutgers, December 2015
- Computational Statistics and Molecular Simulation (COSMOS), Paris, February 2016
- Numerical Aspects of Nonequilibrium Dynamics, Paris, April 2017
- BIRS-CMO Workshop, Oaxaca, November 2018

- Workshop on Entropic Fluctuation Relations, Montreal, October 2018
- Ki-Net: Dimension reduction in physical and data sciences. Duke. April 2019
- Bernoulli Center, EPFL, May 2019
- Quantissima III, Venice, August 2019.
- Non Reversible Markovian Monte-Carlo Methods, Lorentz Center, August 2021
- Meetings on Foundations of Data Science, Tufts University, March 2022
- AFOSR PI Meeting, Arlington, VA, August 2022
- Conference in Honor of J.P. Eckmann 75th birthday, Geneva, Switzerland, June 2022
- ICML 2022, Baltimore, Poster presentation, July 2022
- Neurips 2022, New orleans, Poster presentation, December 2022
- ICLR 2023, Kigali, Rwanda, Poster presentation, April 2023
- AFOSR PI Meeting, Arlington, VA, August 2023
- AFOSR PI Meeting, Arlington, VA, August 2024
- ICERM Meeting. Providence, RI, September 2024

## Seminar talks

- Mathematical physics seminar, ETH, Zürich January 1998
- Mathematical physics seminar, CPT-CNRS, Marseille, January 1998
- Mathematical physics seminar, Institut Fourier Grenoble, February 1998
- Mathematical physics seminar, University Paris-XI Orsay, April 1998
- Mathematical physics seminar, University of Virginia, November 1998
- Colloquium, University of Ottawa, January 1999
- Statistical mechanics seminar, Princeton University, February 1999
- Mathematical physics seminar, University of Geneva, July 1999
- Dynamical systems seminar, SUNY at Stony Brook, November 1999
- Mathematical physics seminar, University of Geneva, July 2000
- Mathematical physics seminar, ETH, Zürich, August 2000
- Colloquium, University of Arizona, October 2000
- Statistical mechanics seminar, Princeton University, February 2001
- Applied mathematics seminar, University of Toronto, March 2001
- Theoretical physics seminar, University of Geneva, May 2001
- Mathematical physics seminar, ETH Zürich, June 2001
- Analysis seminar, University of Helsinki, August 2001
- Mathematical physics seminar, University of Texas at Austin, January 2002
- Colloquium, University of Massachusetts, Amherst, January 2002
- Colloquium, University of Maryland, College Park, January 2002
- Colloquium, University of Rochester, February 2002
- Colloquium, University of Notre Dame, February 2002
- Statistical mechanics seminar, Institute of Advanced Study, February 2002
- Nonlinear analysis seminar, Stevens Institute of Technology, May 2002
- Mathematical physics seminar, Rutgers University, October 2002



- Stochastic processes seminar, Brown University, November 2002
- Mathematical physics seminar, University of Virginia, January 2003
- Condensed matter seminar, University of Massachusetts, April 2003
- Probability seminar, EPFL, Lausanne, June 2003
- Mathematical physics seminar, University of Geneva, June 2003
- Applied mathematics seminar, Duke University, March 2004
- Mathematical physics seminar, University of Geneva, January 2005
- Analysis and numerics seminar, Munich University, January 2005
- Mathematical physics seminar, Munich University, January 2005
- Dynamical systems seminar, Boston University, April 2005
- Nonlinear systems seminar, Stevens Institute of Technology, April 2005
- Mathematical physics seminar, Rutgers University, September 2005
- Mathematical physics seminar, University of Virginia, November 2006
- Mathematical physics seminar, Rutgers University, November 2006
- Applied mathematics seminar, Dartmouth College, April 2007
- Mathematical physics seminar, University of Arizona, October 2007
- Analysis seminar, University of Toronto, October 2007
- Applied mathematics seminar, Brown University, November 2007
- Colloquium, University of Connecticut, February 2009
- Probability seminar, University of Wisconsin, March 2009
- Theoretical physics Seminar, University of Geneva, April 2009
- Mathematical physics Seminar, University of Rome, April 2009
- Mathematical physics Seminar, University of Bologna, April 2009
- Mathematical physics Seminar, University of Grenoble, May 2009
- Applied mathematics Seminar, University of Crete, May 2009
- Mathematical physics seminar, Rutgers University, November 2009
- Operator algebra, University of Tokyo, January 2010
- Joint PDE seminar Boston University – Brown University, November 2010
- Applied Mathematics Seminar, University of Crete, March 2011
- Probability Seminar, Warwick University, March 2011
- Probability Seminar, Boston University, September 2012
- Probability Seminar, University of Delaware, October 2013
- Probability Seminar, Concordia University, May 2015
- Probability Seminar, Brown University, November 2016
- Mathematical physics seminar, Rutgers University, December 2017
- Dynamical systems seminar, Courant Institute, NYU January 2018
- Applied PDE seminar, Imperial College, November 2020
- Probability seminar KTH, November 2020
- Probability and Statistics Seminar, Boston University, November 2024

## Teaching Experience

**University of Massachusetts Amherst** (since 2002)

Fall 2002: „ Math 131 Calculus I

Spring 2003: Math 132 Calculus II

Spring 2003: Math 421 Complex variables

Fall 2003: „ Math 597/697 Introduction to stochastic processes

Spring 2004: Math 131 Calculus I

Fall 2004: „ Math 645 Differential equations and dynamical systems

Spring 2005: Math 646 Ergodic theory

Spring 2005: Math 131 Calculus I

Fall 2005: „ Math 645 Differential equations and dynamical systems

Fall 2005: „ Stat 515 Introduction to Statistics I

Spring 2006: Math 597/697 Introduction to stochastic processes

Fall 2006: „ Math 623 Real analysis I

Fall 2006: „ Math 131H Honor calculus I

Spring 2007: Math 624 Real analysis II

Fall 2007: „ Math 697U Introduction to stochastic processes

Fall 2007: „ Math 331 Differential equations

Spring 2008: Math 331 Differential equations

Fall 2008: „ Math 331 Differential equations

Fall 2008: „ Math 645 Differential equations and dynamical systems

Fall 2009: „ Math 697EG Evolutionary game theory

Spring 2010: Math 697U Introduction to stochastic processes

Spring 2010: Math 331 Differential equations

Fall 2010: Math 623 Real analysis I

Fall 2010: Math 131H Honor calculus I

Fall 2011: Math 623 Real analysis I

Spring 2012: Math 624 Real analysis II

Spring 2012: Math 456 Mathematical Modeling  
 Spring 2013: Math 456 Mathematical Modeling  
 Spring 2013: Math797fn Functional Analysis  
 Fall 2013: Math 623 Real Analysis I  
 Spring 2014: Math 624 Real Analysis II  
 Spring 2014: Math 331 Differential equations  
 Fall 2014: „, Math697U Introduction to stochastic processes  
 Spring 2015: Math 456 Mathematical Modeling  
 Spring 2015: Math 797MR Information Theory  
 Fall 2015: Math 797AB Agent-based modeling  
 Spring 2016: Math 456 Mathematical Modeling  
 Spring 2016: Math 523H Real analysis  
 Fall 2016: Math 797SM Statistical mechanics  
 Spring 2017: Math 331 Differential equations  
 Spring 2017: Math 523H Real analysis  
 Fall 2017: Stat 605 Probability Theory  
 Fall 2017: Math 331 Differential equations  
 Spring 2018: Math697U Stochastic Processes  
 Spring 2019: Math 456 Mathematical Modeling

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 & Spring 2003 & Math 132 Calculus II \ % & Spring 2003& Math 421 Complex variables \ %  
 & Fall 2003& Math 597/697 Introduction to stochastic processes \ % & Spring 2004& Math  
 131 Calculus I \ % & Fall 2004& Math 645 Differential equations and dynamical systems \ %  
 & Spring 2005& Math 646 Ergodic theory \ % & Spring 2005& Math 131 Calculus I \ %  
 & Fall 2005& Math 645 Differential equations and dynamical systems \ % & Fall 2005& Stat  
 515 Introduction to Statistics I \ % & Spring 2006& Math597/697 Introduction to stochastic  
 processes \ % & Fall 2006& Math 623 Real analysis I \ % & Fall 2006& Math 131H Honor  
 calculus I \ % & Spring 2007& Math 624 Real analysis II \ % & Fall 2007& Math 697U  
 Introduction to stochastic processes \ % & Fall 2007& Math 331 Differential equations \ %  
 & Spring 2008& Math 331 Differential equations \ % & Fall 2008 & Math 331 Differential  
 equations \ % & Fall 2008& Math 645 Differential equations and dynamical systems \ % & Fall  
 2009 & Math 697EG Evolutionary game theory \ % & Spring 2010 & Math 697U Introduction  
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1995-1996: Dynamical systems and ergodic theory

1996-1997: Mathematics for engineers

1996-1997: Numerical methods for PDE

1997-1998: Analysis II

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scientists \ % & 1994-1995& Function of several complex variables \ % & 1995-1996& Analysis  
I \ % & 1995-1996& Dynamical systems and ergodic theory \ % & 1996-1997& Mathematics  
for engineers \ % & 1996-1997& Numerical methods for PDE \ % & 1997-1998& Analysis II  
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