BIOGRAPHY

Fraydoun Rezakhanlou

Education:

- **1986** M.S., University of Virginia, Charlottesville, VA
- **1989** Ph.D., New York University, New York, NY

Appointments:

- **1989-90** Visiting Member, Postdoctoral Position, Courant Institute
- **1990-91** Visiting Member, Postdoctoral Position, Institute for Advanced Study
- **1991** Assistant Professor, Department of Mathematics, UC Berkeley
- **1997** Associate Professor, Department of Mathematics, UC Berkeley
- **2004** Professor, Department of Mathematics, UC Berkeley

Awards and Honors:

- **1980** First place recipient in the National Mathematics Competition sponsored by the Iranian Mathematical Society
- **1989** Jay Krakauer Award from the Graduate School of Arts and Science
- **1994** Sloan Foundation Fellowship

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Fraydoun Rezakhanlou

1. The packing measure of the graph and the level sets of certain continuous functions, *Math. Proc. Cambridge Philos. Soc.*, **104**, 347–360, (1988).

2. The packing measure of the graph of a stable process (with S.J. Taylor) *Asterisque* no.157–158, as a part of Proceedings of Paul Lévy Conference, (1988).

3. Hydrodynamic limit for a system with finite range interactions, *Comm. Math. Physics*, **129**, 445–480, (1990).

4. Hydrodynamic limit for attractive particle systems on Z^d, *Comm. Math. Physics*, **140**, 417–448, (1991).

5. Propagation of chaos for symmetric simple exclusions, *Comm. Pure Appl. Math.*, XLVII 943–957, (1994).

6. Evolution of tagged particles in non-reversible particle systems, *Comm. Math. Physics*, **165**, 1–32, (1994).

7. Microscopic structure of shocks in one conservation laws, *Ann. Inst. H. Poincar Probab. Statist.*, **12**, 119–153, (1995).

8. Kinetic limits for a class of interacting particle systems, *Probab. Theory Related Fields*, **104**, 97–146, (1996).

9. Propagation of chaos for particle systems associated with discrete Boltzmann equation, *Stochastic Process. Appl.*, **64**, 55–72, (1996).

10. Hydrodynamic limit for particle systems with nonconstant speed parameter (with P.Covert), *J. Statist. Phys.*,**88**, 383–426, (1997).

11. Boltzmann-Grad limit for a particle system in continuum, (with J. E. Tarver), *Ann. Inst. H. Poincar Probab. Statist*, **33**, 753–796, (1997).

12. Equilibrium fluctuations for the discrete Boltzmann equation, *Duke Math. J.*, **93**, 257–288, (1998).

13. Large deviations from a kinetic limit, *Ann. Probab.*, 26, 1259–1340, (1998).

14. A stochastic model for the sandpile growth and its continuum limit (with L.C.Evans), *Comm. Math. Phys.*, **197**, 325–345, (1998).

15. Large deviations for the symmetric simple exclusion process in dimension $d \geq 3$, (with J. Quastel and S.R.S Varadhan), *Probab. Theory Related Fields,* **113**, 1–84 (1999).

16. Homogenization for stochastic Hamilton-Jacobi PDEs, (with J. L. Tarver), *Arch. Rational Mech. Anal.,* **151**, 277–309 (2000).

17. Central limit theorem for stochastic Hamilton-Jacobi equations, *Comm. Math. Physics* **211**, 413–438 (2000).

18. Continuum limit for some growth models (II), *Ann. Probab.,* **29**, 1329–1372 (2001).

19. Continuum limit for some growth models, *Stochastic Process. Appl.* **101**, 1–41 (2002).

20. A Central limit theorem for the asymmetric simple exclusion process, *Ann. Inst. H. Poincar- Probab. Statist.* **38**, 437–464 (2002).

21. A stochastic model associated with Enskog equation and its kinetic limit,*Comm. Math. Physics* **232**, 327–375 (2003).

22. Boltzmann-Grad limits for stochastic hard sphere models , *Comm. Math. Phys.* **284**, 555–637 (2004).

23. Stochastic homogenization of Hamilton-Jacobi-Bellman equations, (with E. Kosygina and S.R.S. Varadhan), *Comm. Pure Appl. Math.* **59**, 1489–1521(2006).

24. Kinetic limit for a system of coagulating planar Brownian particles, (with Alan Hammond), *J. Statist. Phys.* **123**, 997–1040 (2006).

25. The coagulating Brownian particles and Smoluchowski's equation. Markov Process. Related Fields 12 , 425–445, (2006).

26. The kinetic limit of a system of coagulating Brownian particles, (with Alan Hammond) *Arch. Rational Mech. Anal.***185**, 1–67, (2007).

27. Moment bounds for the Smoluchowski equation and their consequences (with Alan Hammond) *Comm. Math. Phys.* **276**, 645–670 (2007)

28. Scaling Limits for Microscopic Models. (BOOK) IPM Lecture Notes Series **6**, (2007).

29. Entropy Methods for the Boltzmann Equation. (BOOK) (with Cedric Villani) Lecture Notes in Mathematics **1916**, Springer, (2008).

30. Coagulation, diffusion and the continuous Smoluchowski equation (with Alan Hammond and Mohammad Reza Yaghouti) *Stochastic Process. Appl.* **119**, 3042–3080 , (2009).

31. Equilibrium fluctuations for a model of coagulating-fragmenting planar Brownian particles, (with Mojtaba Ranjbar) *Comm. Math. Phys.* **296**, 769–826 (2010).

32. Moment bounds for the solutions of the Smoluchowski equation with coagulation and fragmentation, *Proc. Roy. Soc. Edinburgh Sect. A,* **140**, 1041–1059 (2010).

33. A prelude to the theory of random walks in random environments, *Bull. Iranian Math. Soc.* **37,** No. 2, 5–20 (2011).

34. Gelation for Marcus-Lushnikov process, *Ann. Probab.* **41**, No. 3B, 1806-1830 (2013).

35. Pointwise Bounds for the Solutions of the Smoluchowski Equation with Diffusion, *Arch. Rational Mech. Anal.* **212**, 1011–1035 (2014).

36. Stochastically Symplectic Maps and Their Applications to Navier-Stokes Equation, *Ann. Inst. H. Poincaré-Anal. Non Linéire.* **33**, No. 1, 1–22 (2016).

37. Scalar conservation laws with monotone pure-jump Markov initial conditions (with D. Kaspar). *Probab. Theory Related Fields.* **165**, No. 34, 867–899 (2016).

38. Poincaré–Birkhoff theorems in random dynamics (with A. Pelayo). *Trans. Amer. Math. Soc.* **370**, No. 1, 601–639 (2018).

39. Stochastic Solutions to Hamilton-Jacobi Equations. Springer Proceedings in Mathematics and Statistics **282**, 206-238 (2019).

40. Kinetic statistics of scalar conservation laws with piecewise-deterministic Markov process data (with Dave Kaspar) *Arch. Rational Mech. Anal.* **237**, No. 1, 259–298 (2020).

41. Random Tessellations and Gibbsian Solutions of Hamilton-Jacobi Equations (with Mehdi Ouaki), *Comm. Math. Phys.* **394**, 409-470 (2022).

42. Scaling limit of small random perturbation of dynamical systems (with Insuk Seo), published online *Ann. Inst. H. Poincaré-Anal.Probab. Statist.* (2022).

43. Hamiltonian ODE, Homogenization, and Symplectic Topology. A chapter in Hamiltonian Systems Dynamics, Analysis, Applications , pp. 297 - 367, MSRI Book Series, volume **72**. Combridge University Press, 2024.

44. Kinetic description of scalar conservation laws with Markovian data, arXiv:2309.04096.

45. The random Arnold Conjecture: a new probabilistic Conley-Zehnder Theory for symplectic maps, (with Alvaro Pelayo). arXiv.2306.15586 .

46. A Kinetic Approach to Burgers Equation with White Noise Initial Data (with Mehdi Ouaki).

Books and Lecture Notes

1. Scaling Limits for Microscopic Models. Lecture Notes Series 6, IPM

2. Entropy Methods for the Boltzmann Equation. (with C. Villani) LNM **1916**, Springer

3. Lectures on Symplectic Geometry

4. Lectures on Dynamical Systems
5. Lectures on Random Matrices
6. Lectures on Large Deviation Principle
7. Hamiltonian ODE, Homogenization, and Symplectic Topology
8. Stochastic Growth and KPZ Equation
9. Stochastic PDE

Ph.D. Students Supervised:
1. Paul Covert (Boeing), 2. James E. Tarver (SAP, Palo Alto), 3. Alan M. Hammond (UC Berkeley), 4. Kay Kirkpatrick (University of Illinois), 5. Mohammad-Reza Yaghouti (University of Guilan), 6. Mojtaba Ranjbar (Azarbaijan Shahid Madani University), 7. Ivan Matic (Baruch College, CUNY), 8. Dave Kaspar (Arizona State University), 9. Elan Bechor (Genomic Prediction, New York), 10. Chris Policastro (Center for Data Science, NYU), 11. Chanwoo Oh, 12. Kyeongsik Nam (Kaist, Korea), 13. Mehdi Ouaki (Two Sigma, New York), 14. Haotian Gu (Citadel Securities) 15. Vinh-Kha Le (Current)

Postdoctoral Scholars Sponsored: Atilla Yilmaz (2009-2011), Max Fathi (2015-2016), Insuk Seo (2016-2017), Kevin Yang (2022-2023)

Recent Synergistic activities:

1. (Organizer) The Eighth Pacific Rim Conference in Mathematics, U.C. Berkeley, August 3-7 2020.
2. (Organizer) Conference in Honor of S. R. S. Varadhan's 80th Birthday, Jeju, South Korea, June 13-17 2022.
3. Associated Editor for Annals of Probability 2015-2021
4. Associate Editor for SIAM Journal of Mathematical Analysis 01/2020-present

Recent Mini courses:

1. Large and Small Deviations in Boltzmann-Grad Limit (4h), Scaling limits in Kinetic theory Summer School - Lyon - Oct 2019 .
2. 2019 Charles J. Amick Lectures at University of Chicago, Department of Mathematics. February 10-12, 3 lectures. Title: Metastability, Stochastic Tunneling and Condenstaion
3. Growth Models and Hamilton-Jacobi PDEs (4.5 h) March 2023, Gran Sasso Science Institute (GSSI), L'Aquila, Italy
4. Symplectic geometry and probability (4.5 h), Jun 2023, Universidad Complutense de Madrid, Spain