Name: Dr. Nándor Simányi

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1. Professional Preparation

Roland Eötvös University, Budapest, Mathematics major, Diploma (rough equivalent of M.S.) 1980.
Roland Eötvös University, Budapest, Ph. D. Program in Mathematics, Ph.D., 1987.
Hungarian Academy of Sciences, Budapest, Candidate of Mathematical Sciences (C. Sc. rough equivalent of a strong Ph.D.), 1989.
Hungarian Academy of Sciences, Budapest, Doctor of Mathematical Sciences (D. Sc. rough equivalent of "Full Professor"), 1995.

2. Appointments

2002–present The University of Alabama at Birmingham, Professor
1999-2002 The University of Alabama at Birmingham, Associate Professor
1996-1999 The University of Szeged, Professor
1995-1996 The Pennsylvania State University (State College), Associate Professor
1992-1993 Indiana University (Bloomington), Assistant Professor
1991-1992 Northwestern University (Evanston), Assistant Professor
1989-1990 The University of Southern California (Los Angeles), Associate Professor
1982-1985 (minus the above intervals) The Mathematical Institute of the Hungarian Academy of Sciences (Budapest), Senior Research Fellow.

3. Products

List of publications:

1. Algebraic Invariants in the Theory of Shape, *Matematikai Lapok*, **30**, No. 1-3. (1978-1982), pp. 135-153. (In Hungarian.)

2. Random walks with internal states and the Fourier law of heat conduction, *Proc. of the American-Hungarian Workshop on Multivariate Analysis*, Stanford, (1984), 28-31. (Jointly with A. Krámli and D. Szász.)

3. Random walks with internal degrees of freedom. III. Stationary probabilities, *Probab. Th. Rel. Fields.* **72** (1986), 603-617. (Jointly with A. Krámli and D. Szász.)

4. Heat conduction in caricature models of the Lorentz gas, *J. of Statistical Physics*, **46** (1987), 303-318. (Jointly with A. Krámli and D. Szász.)

5. Two-particle billiard system with arbitrary mass ratio, *Ergodic theory and dynamical systems*, Vol. **9** (1989), 165-171. (Jointly with M. P. Wojtkowski.)

6. Towards a proof of recurrence for the Lorentz process, *Banach Center Publications*, Volume **23**, Dynamical Systems and Ergodic Theory, pp. 265-276 (1989).

7. Dispersing billiards without focal points on surfaces are ergodic, *Commun. Math. Phys.* **125**, 439-457 (1989). (Jointly with A. Krámli and D. Szász.)

8. Ergodic properties of semi-dispersing billiards. I. Two cylindric scatterers in the 3-D torus, *Nonlinearity*, **2** (1989), pp. 311-326. (Jointly with A. Krámli and D. Szász.)

9. The K-property of three billiard balls, *Annals of Mathematics*, **133** (1991), 37-72. (Jointly with A. Krámli and D. Szász.)

10 A ‚Transversal' Fundamental Theorem for Semi–Dispersing Billiards, *Commun. Math. Phys.* **129**, 535-560 (1990). (Jointly with A. Krámli and D. Szász.)

11. Dual Polygonal Billiards and Necklace Dynamics, *Commun. Math. Phys.* **143**, 431-449 (1992). (Jointly with E. Gutkin.)

12. The K–Property of Four Billiard Balls, *Commun. Math. Phys.* **144**, 107-148 (1992). (Jointly with A. Krámli and D. Szász.)

13. The K–Property of N Billiard Balls I. *Inventiones Mathematicae* **108**, 521-548 (1992).

14. The K–Property of N Billiard Balls II. Computation of Neutral Linear Spaces, *Inventiones Mathematicae* **110**, 151-172 (1992).

15. The K-Property of 4-D Billiards with Non-Orthogonal Cylindric Scatterers, *Journal of Statistical Physics*, Vol. **76**, Nos. 1/2, 587-604 (1994). (Jointly with D. Szász).

16. The Boltzmann-Sinai Ergodic Hypothesis for Hard Ball Systems, *Workshop on Dynamical Systems and Related Topics. 1994 Meetings University of Maryland & Penn State.* Abstract of Talks, 1994.

17. The K-Property of Hamiltonian Systems with Restricted Hard Ball Interactions, *Mathematical Research Letters*, **2**, No. 6, 751-770, (1995). (Jointly with D. Szász.)

18. The Ergodicity of Sinai's Pencase Model, *Workshop on Dynamical Systems and Related Topics. 1995 Meetings University of Maryland & Penn State.* Abstract of Talks, 1995.

19. Ball-avoiding theorems, *Ergodic Theory and Dynamical Systems Abstracts,* eds. K. Baranski, F. Przytycki. Stefan Banach International Mathematical Center 1995.

20. The Characteristic Exponents of the Falling Ball Model, *Communications in Mathematical Physics* **182**, 457-468 (1996).

21. Studying Dynamical Systems With Algebraic Tools, *Progress in Mathematics*, Vol. **169**, pp. 200–210. Birkhäuser Verlag, 1998.

22. Rotation-symmetric Surfaces of Soap Film and the Theorem of Charles Delaunay. *Century 2 of KöMaL* (Published by the Roland Eötvös Physical Society), Vol.**2**, pp. 181–190. (Jointly with Péter Gnädig.)

23. Non-integrability of Cylindric Billiards, in "Dynamical systems: From crystal to chaos." Editors: J.-M. Gambaudo, P. Hubert, P. Tisseur, S. Vaienti. World Scientific Publishing Co. 2000, pp. 303–306.

24. Hard Ball Systems Are Completely Hyperbolic, *Annals of Mathematics,* **149, No. 1**, 35–96 (1999), arXiv:math.DS/9704229 (Jointly with D. Szász.)

25. Ergodicity of Hard Spheres in a Box, *Ergodic Theory and Dynamical Systems* Vol. **19** (1999), 741–766.

26. Non-integrability of Cylindric Billiards and Transitive Lie Group Actions. *Ergodic Theory and Dynamical Systems*, Vol. **20** (2000), 593-610. (Jointly with D. Szász)

27. Hard Ball Systems and Semi-Dispersive Billiards: Hyperbolicity and Ergodicity. *Encyclopedia of Mathematical Sciences*, **Vol. 101**, Mathematical Physics II. Edited by D. Szász, Springer Verlag 2000, pp. 51–88.

28. The Complete Hyperbolicity of Cylindric Billiards. *Ergodic theory and dynamical systems,* Vol. **22** (2002), 281–302. arXiv:math.DS/9906139

29. Proof of the Boltzmann–Sinai Ergodic Hypothesis for Typical Hard Disk Systems. *Inventiones Mathematicae,* Vol. **154** (2003), No. 1, pp. 123-178. arXiv:math.DS/0008241

30. Proving The Ergodic Hypothesis for Billiards With Disjoint Cylindric Scatterers. *Nonlinearity,* Vol. **17** (2004), pp. 1-21. arXiv:math.DS/0207223

31. Proof of the Ergodic Hypothesis for Typical Hard Ball Systems. *Annales Henri Poincaré* **5** (2004), pp. 203–233. arXiv:math.DS/0210280

32. On the complexity of curve fitting algorithms. (Jointly with N. Chernov and C. Lesort.) *Journal of Complexity*, Vol. **20**, Issue 4, August 2004, pp. 484-492. arXiv:cs.CC/0308023

33. A Note on the Size of the Largest Ball Inside a Convex Polytope. *Period. Math. Hungar.* Vol. 51, No. 2 (December 2005), pp. 15-18. (Jointly with I. Bárány.) arXiv:math.MG/0505301, DOI: 10.1007/s10998-005-0026-4

34. Rotation sets of billiards with one obstacle. *Commun. Math. Phys.* Vol. 266, No. 1 (August, 2006), pp. 239-265. (Jointly with A. Blokh and M. Misiurewicz) arXiv:math.DS/0508300

35. Flow-invariant hypersurfaces in semi-dispersing billiards. (Jointly with N. I. Chernov.) *Annales Henri Poincare* **8** (2007), 475-483. DOI 10.1007/s00023-006-0313-5

36. Upgrading Local Ergodic Theorem for planar semi-dispersing billiards (Jointly with N. Chernov.) *J. Stat. Phys.*, **139 No. 3** (2010), 355-366. DOI: 10.1007/s10955-010-9927-6

37. Conditional Proof of the Boltzmann-Sinai Ergodic Hypothesis. *Inventiones Mathematicae,* Vol. 177, No. 2 (August 2009), pp. 381–413, DOI: 10.1007/s00222-009-0182-x

38. Sums of squares and orthogonal integral vectors. *Journal of Number Theory* **Vol. 132,** Issue 1, January 2012, Pages 37-53. (Joint work with Lee M. Goswick, Emil W. Kiss, and Gábor Moussong) http://dx.doi.org/10.1016/j.jnt.2011.07.001

39. Homotopical Complexity of 2D Billiard Orbits, *Studia Sci. Math. Hungar.* 48(4), 540-562 (2011). (Jointly with Lee M. Goswick), arXiv:1008.1623, DOI:10.1556/SScMath.48.2011.4

40. G. Moussong, N. Simányi, Circle decompositions of surfaces, *Topology and its Applications* 158 (2011) 392–396. doi:10.1016/j.topol.2010.11.015

41. N. Chernov, A. Korepanov, N. Simanyi, Stable regimes for hard disks in a channel with twisting walls, *Chaos* Vol.22, Issue 2, June 2012.

42. Singularities and nonhyperbolic manifolds do not coincide. *Nonlinearity* **26 (2013)** 1703-1717. http://dx.doi.org/10.1088/0951-7715/26/6/1703

43. Matthew P. Clay, Nándor J. Simányi, Rényi's Parking Problem Revisited, *Stochastics and Dynamics,* Vol. **16, No. 2** (2016). DOI: 10.1142/S0219493716600066

44. Simányi N. (2019) Further Developments of Sinai's Ideas: The Boltzmann–Sinai Hypothesis. In: Holden H., Piene R. (eds) The Abel Prize 2013-2017. The Abel Prize. Springer, Cham
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45. Caleb C. Moxley, Nandor J. Simanyi Homotopical complexity of a $3D$ billiard flow, in Dynamical Systems, Ergodic Theory, and Probability: in Memory of Kolya Chernov, Contemporary Mathematics, vol. 698, Amer. Math. Soc., Providence, RI, 2017, pp. 169-180.
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46. Caleb C. Moxley, Nándor Simányi, Homotopical complexity of a billiard flow on the 3D flat torus with two cylindrical obstacles, *Ergodic Theory and Dynamical Systems,* **Vol. 39, No. 4,** April 2019, pp. 1071-1081. DOI: https://doi.org/10.1017/etds.2017.62

47. Nándor Simányi, Conditional Proof of the Ergodic Conjecture for Falling Ball Systems, *Contemporary Mathematics,* **Volume 797,** 2024 pp. 75-83. DOI: https://doi.org/10.1090/conm/797/15935

48. Nándor Simányi, Proof of Wojtkowski's Falling Particle Conjecture,
DOI: https://doi.org/10.48550/arXiv.2407.12033
To appear in the AMS book series Contemporary Mathematics.

49. Nándor Simányi, Asymptotic Homotopical Complexity of an Infinite Sequence of Dispersing $2D$ Billiards,
https://doi.org/10.48550/arXiv.2501.16284

4. Synergistic Activities

I regularly teach the Algebra I, Linear Algebra, and Ergodic Theory graduate courses with great enthusiasm and pleasure. My primary goal in those courses is to teach the students the way of modern mathematical thinking, especially the abstract way as algebraists conceive the mathematical world. For this purpose, I have developed my own brand new curriculum for the abstract algebra and ergodic theory courses, along with my notes and homework problems, distributed to the students electronically. I regularly present enlightening examples – related to my own research – to my students, and in this way I am integrating my research into the education.

Ten years ago I served as the Graduate Program Director of our department, and that gave me a very good opportunity to learn more about the needs of our graduate students: Where, and in what respect should we improve our graduate program, curricula, etc.

I am a member of the Editorial Board of the journal Ergodic Theory and Dynamical Systems.