

## CURRICULUM VITAE

Name: Dr. Nandor Simanyi

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### (i) 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.

### (ii) 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.

### (iii) 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 cylindrical 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 Poincaré* **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.48.2011.4.1191
40. G. Moussong, N. Simányi, Circle decompositions of surfaces, *Topology and its Applications* 158 (2011) 392396. 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. Further Developments of Sinai's Ideas: The Boltzmann-Sinai Hypothesis. To appear in 'The Abel Prize, Vol. 3, 2013-2017' Editors: Holden, Helge, Piene, Ragni.
45. Homotopical Complexity of a 3D Billiard Flow. Jointly with Caleb C. Moxley. To appear in the Proceedings of the Conference on Dynamical Systems, Ergodic Theory, and Probability. Edited by: A. Blokh, I. Bunimovich, P. Jung, L. Oversteegen, and Ya. Sinai. Contemporary Mathematics, 2017.
46. Homotopical complexity of a billiard flow on the 3D flat torus with two cylindrical obstacles, CALEB C. MOXLEY and NANDOR J. SIMANYI DOI: <https://doi.org/10.1017/etds.2017.62> Published online: 07 September 2017

**(iv) Selected Talks.**

1. Colloquium talk at UAB, January 2013, “Status of Boltzmann-Sinai Hypothesis: Checkmarked”
2. Lewis Parker Lecture delivered at the Annual AACTM Meeting at Birmingham Southern College, “Brief history of the Boltzmann-Sinai Ergodic Hypothesis”, January 2013
3. Talk at the AMS Sectional Meeting in Oxford, Mississippi, March 3, 2013, “Brief history of the Boltzmann-Sinai Ergodic Hypothesis”
4. University of Maryland, Spring 2013 Workshop on Dynamical Systems and Related Topics, 3 April 2013, “Brief history of the Boltzmann-Sinai Ergodic Hypothesis”
5. Geometry, Dynamics, and Topology Days 2013 at Eastern Illinois University, April 19-20, 2013, “Brief History of the Boltzmann-Sinai Hypothesis”
6. Colloquium talk at Clemson University, November 2013, “Brief history of the Boltzmann-Sinai Ergodic Hypothesis”
7. Talk “Renyi’s Parking Problem Revisited” given at the AMS Sectional Meeting in Knoxville, TN, March 21-23, 2014
8. Colloquium talk “Rnyi’s Parking Problem Revisited” given at the Mathematics Department of the University of Mississippi, Oxford, MS, March 26, 2014
9. Darlymple Lecture: “The Boltzmann-Sinai Hypothesis: a Mystery Solved”, a distinguished public lecture given at the University of Mississippi, Oxford, MS, March 27, 2014
10. “The Boltzmann-Sinai Hypothesis: a Mystery Solved”, Department of Mathematics Colloquium talk at the University of Memphis, April 4, 2014
11. “The Boltzmann-Sinai Hypothesis: A mystery solved”. Invited talk at “The Budapest–Vienna Dynamics Seminar”, Budapest, Hungary, May 8, 2014
12. “Rnyi’s Parking Problem Revisited”. Plenary talk at Szeged Geometry Day, Szeged, Hungary, May 22, 2014
13. Invited participant of the “Fourth Abel Conference: A Celebration of Yakov G. Sinai” held at the Institute for Mathematics and Applications of the University of Minnesota, October 31–November 2, 2014. Also, in connection with the above, I am an invited author of the third volume of the Springer book series on the Abel Prize laureates, devoted to the mathematical achievements of Yakov G. Sinai.
14. “Wojtkowskis Falling Balls Revisited”. Talk at the AMS Special Session on Ergodic Theory and Dynamical Systems as part of the Joint Mathematics Meetings, San Antonio, TX, January 2015.
15. “On homotopical rotation numbers”. Talk at the “Special Session on Topology and Topological Methods in Dynamical Systems, II” as part of the AMS Southeastern Sectional Meeting, Huntsville, AL, March 2015.
16. “On homotopical rotation vectors of billiards”. One hour long plenary talk at the Geometry, Topology, and Dynamics Day at Eastern Illinois University, Charleston, IL, April 25, 2015
17. “Homotopical rotation vector of billiards”. Plenary talk at THE DYNAMICAL SYSTEMS, ERGODIC THEORY, AND PROBABILITY CONFERENCE DEDICATED TO THE MEMORY OF NIKOLAI CHERNOV, Birmingham, AL, May 19, 2015.
18. “Homotopical Complexity of Certain 3D Cylindric Billiards”. Talk at the Special Session on Fractal Geometry and Dynamical Systems as part of the AMS Southeastern Sectional Meeting, Memphis, TN, October 2015.
19. “Noncommutative rotation vectors for toroidal billiards”. Short talk at the 114th STATISTICAL MECHANICS CONFERENCE held at Rutgers University, December 13–15, 2015.

**(v) Awarded Research Grants.**

NSF-DMS 0098773 “Non-uniformly Hyperbolic Dynamical Systems with Singularities” 2001-2004, \$91,297.00

NSF-DMS 0457168 “Open Problems in the Theory of Mathematical Billiards” 2005–2008, \$109,475.00

NSF-DMS 0800538 “Ergodic Properties of Mathematical Billiards” 2008–2011, \$125,818.00

NSF-DMS 1301537 “Dynamical Models for Superdiffusion and Superconductivity” September 8, 2014–May 31, 2015, \$34,412.00

**(vi) Special Awards.**

1. “Henri Poincare Medal”, awarded by the journal “Annales Henri Poincare” for the best paper of 2004 in that journal, presented at the International Congress of Mathematical Physics, Rio de Janeiro, August 2006.

2. “Excellence in Teaching Award”, given by the National Society of Leadership and Success, April 2013.

**(vii) 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.

**(viii) Collaborators and Other Affiliations.****(a) Collaborators and Co-Editors.**

Bárány, Imre (University College of London, Alfréd Rényi Mathematical Institute, Budapest)

Blokh, Alexander (The University of Alabama at Birmingham)

Chernov, Nikolai (The University of Alabama at Birmingham)

Goswick, Lee M. (The University of Alabama at Birmingham)

Kiss, Emil W. (Roland Eotvos University, Budapest)

Korepanov, Alexey I. (The University of Warwick, UK)

Lesort, Claire (The University of Alabama at Birmingham)

Misiurewicz, Michal (Indiana University Purdue University at Indianapolis)

Moussong, Gábor (Roland Eotvos University, Budapest)

Szász, Domokos (Budapest University of Technology and Economics)

**(b) Graduate and Postdoctoral Advisors.**

Szász, Domokos (Budapest University of Technology and Economics)

**(c) Current Ph. D. Student.**

Moxley, Caleb C. (The University of Alabama at Birmingham)