

Curriculum Vitae (Tomaž Prosen, status as of August 2020)

Personal information

Researcher-ID: **F-1369-2011**, ORCID: 0000-0001-9979-6253

Webpage: `chaos.fmf.uni-lj.si`, Nationality: Slovenian, Date of birth: 06 April 1970

Education

- Doctor of Science degree (equiv. of PhD): 27 June 1995, Department of Physics, Faculty of Natural sciences and Technology, University of Ljubljana
- Master of Science degree: 21 October 1993, same department
- Diploma (4-year/8-semester university program): 24 September 1991, same department

Current and previous positions

- From June 2008: Full professor, Faculty of mathematics and physics, Department of physics, University of Ljubljana; early invited appointment based on exceptional procedure according to the rules of University
- From January 2004: Associate professor, Faculty of mathematics and physics, Department of physics, University of Ljubljana; early invited appointment
- From October 1999: Assistant professor, Faculty of mathematics and physics, Department of physics, University of Ljubljana
- From February 1996: Research and teaching assistant, Faculty of mathematics and physics, Department of physics, University of Ljubljana
- From September 1995 to February 1996: Post-doctoral fellow, Institut Henri Poincaré, Paris
- From October 1991 to August 1995: PhD fellow, Center for Applied Mathematics and Theoretical Physics (CAMTP), University of Maribor
- Visiting professor positions: January–February 2004, National university of Singapore; January–April 2006, CNRS professor, Institut Henri Poincaré, Paris; March–August 2010 and March/April 2011, Bessel awardee (Humboldt foundation) at University of Potsdam

Fellowships and awards

- March 2016: Awarded ERC Advanced Grant (AdG 2015)
- December 2009: Wilhelm Friedrich Bessel Award of Alexander von Humboldt foundation
- November 2005: Awarded the “Zois prize for outstanding achievements in science”, highest rank national science award of Republic of Slovenia
- November 2000: Awarded the “Citation Superstar plaque” by ISI (Institute for Scientific Information) as “the most cited young scientists of Slovenia, under age 30”
- March 1998: Awarded Jožef Stefan Golden Emblem for an outstanding doctoral dissertation

Teaching activities (ongoing or in recent academic years)

Graduate courses: Advanced quantum mechanics, Advanced computational physics, Theory of dynamical systems; *Undergraduate course:* Mathematical physics

Supervision of graduate students and postdoctoral fellows

- Completed PhD (12): Marko Žnidarič (professor, University Ljubljana (UL)), * Martin Horvat (senior researcher, UL), * Carlos Pineda (professor, UNAM, Mexico/co-advising), * Iztok Pižorn (Goldman Sachs), * Zoran Levnajić (professor, Laboratory of Data Technologies, Novo Mesto/co-advising), * Bojan Žunkovič (teaching assistant and researcher, computer science dept., UL), * Enej Ilievski (senior researcher, UL), * Berislav Buča (postdoc, Oxford), * Marko Medenjak (postdoc, ENS Paris), * Lenart Zadnik (postdoc, Paris Sud), * Ivan Kukuljan (postdoc, MPIQO Garching), * Katja Klobas (postdoc, Oxford); 3 ongoing PhD students
- Current and past postdocs: Bruno Bertini, Spyros Sotiriadis, Marton Mestyan, Felix Fritsch, Mathieu Vanicat, Szabolcz Vajna, Mariya Medvedyeva, Ugo Marzolino, Humberto Lemos, Gregor Veble

Membership of international scientific societies and editorial boards

- From 2019: Associate Editor of *Journal of Statistical Physics* (Springer) (IF2018: 1.51)
- From 2016: Editorial Board Member of *J. Phys. A: Math. Theor.* (IOP) (IF2018: 2.11)
- From 2014: Member of the European Academy of Sciences and Arts (www.euro-acad.eu)
- 2010–2016: Editorial Board Member of *New Journal of Physics*, published jointly by the British Institute of Physics (IOP) and Deutsche Physikalische Gesellschaft (DFG) (IF2018: 3.77)
- 2010–2019: Associate Editor of the renewed mathematical-physics journal *Chaos, Solitons & Fractals*, published by Elsevier (IF2018: 3.38)
- From 2008: Associate member of Centro Internacional de Ciencias A. C., sponsored by National University of Mexico (UNAM) (www.cicc.unam.mx)
- 2000–2006: Editorial Board Member of mathematical-physics journal *Nonlinearity*, Published Jointly by IOP (Institute of Physics) and LMS (London Mathematical Society) (IF2018: 1.73)

Selected (major) international collaborations

* G. Casati and G. Benenti, University of Insubria, Como, Italy, *Quantum chaos, nonlinear dynamics*;
* T. H. Seligman, Institute of Physical Sciences, UNAM, Mexico, *Quantum chaos, many-body physics, quantum information*; * J. Eisert, Free University, Berlin, Germany, *Many-body physics, quantum information*; * T. Kottos, Wesleyan University, Middletown CT, USA, *Quantum chaos, nonlinear waves*; * K. Saito, Keio University, Yokohama, Japan, *Non-equilibrium stat. mech., transport*; * M. Mierzejewski, University Wrocław, Poland, *Strongly correlated electrons, non-equilibrium stat. mech.*; * B. Li, University of Colorado, Boulder, USA, *Transport*; * J-S Caux, University of Amsterdam, The Netherlands, *Integrable systems out of equilibrium*; * F. H. L. Essler, Oxford University, UK, *Integrable systems out of equilibrium*; * P. Ribeiro, University Lisbon, Portugal, *Dissipative quantum dynamics*; * J. I. Cirac, Max Planck Institut for Quantum Optics, Garching, Germany, *Tensor networks*; * J. P. Garrahan, University Nottingham, UK, *Exactly solvable stat.-mech. of cellular automata*

10-Year Track-Record

Bibliometrics of Prosen, as of August 2020: **215** refereed original scientific publications (refereed conference proceedings/book chapters not included), most with 1-3 authors, all with 6 or less authors.

Web of Science: **7141** citations in total (**6160** without self citations), Hirsch index $h = 46$

Google scholar: **10479** citations, Hirsch index $h = 54$

Journals most frequently published in: *Physical Review Letters*: **46** articles (**5** PRLs as a single author), *Journal of Physics A: Math. Theor.* (*Math. Gen.*, until 2006): **45** articles, *Physical Review*

E: 29 articles.

Ten (10) selected recent key publications:

1. B. Bertini, P. Kos and T. Prosen, *Exact Correlation Functions for Dual-Unitary Lattice Models in 1+1 Dimensions*, Phys. Rev. Lett. **123**, 210601 (2019). **8/22** citations (according to: Web of Science/Google Scholar). *Identification of a broad class of quantum circuits with dual unitarity property, meaning that the propagator is unitary both in temporal and spatial directions. Local spatio-temporal correlations are computed explicitly and classified in distinct ergodic behaviors.*
2. K. Klobas, M. Medenjak, T. Prosen, M. Vanicat, *Time-dependent matrix product ansatz for interacting reversible dynamics*, Commun. Math. Phys. **371**, 651 (2019). **6/11** citations. *Dynamics of local observables in time-translation invariant states is computed explicitly in terms of matrix product ansatz for the Rule 54 reversible interacting cellular automaton; as applications we compute the dynamical structure factor and solve the inhomogeneous quench problem.*
3. B. Bertini, P. Kos and T. Prosen, *Entanglement spreading in a minimal model of maximal many-body quantum chaos*, Phys. Rev. X **9**, 021033 (2019). **25/53** citations. *We compute dynamics of entanglement entropy for the self-dual kicked Ising model and a class of solvable initial states. The first known non-quasiparticle model with exact result on entanglement dynamics.*
4. M. Ljubotina, M. Žnidarič and T. Prosen, *Kardar-Parisi-Zhang physics in the quantum Heisenberg magnet*, Phys. Rev. Lett. **122**, 210602 (2019). **20/45** citations. *A surprising discovery of universal Kardar-Parisi-Zhang scaling of dynamical correlations in a coherent (non-dissipative/non-noisy) quantum integrable system – The Heisenberg model.*
5. B. Bertini, P. Kos and T. Prosen, *Exact spectral form factor in a minimal model of many-body quantum chaos*, Phys. Rev. Lett. **121**, 264101 (2018).* **30/61** citations. *The first exact computation of random matrix spectral form factor in a locally interacting quantum lattice model, developing a novel transfer matrix method.*
6. P. Kos, M. Ljubotina and T. Prosen, *Many-body quantum chaos: Analytic connection to random matrix theory*, Phys. Rev. X **8**, 021062 (2018).* **38/63** citations. *Discovery of a dynamical mechanism akin to periodic orbit theory explaining the emergence of random matrix spectral correlations in many-body quantum spin systems.*
7. M. Ljubotina, M. Žnidarič and T. Prosen, *Spin diffusion from an inhomogeneous quench in an integrable system*, Nature Commun. **8** 16117 (2017). **80/113** citations. *An efficient numerical simulation of a mixed-state inhomogeneous quench problem for the anisotropic Heisenberg model: classifying transport types as ballistic, diffusive and super-diffusive in easy-plane, easy-axis and isotropic regimes: observation of dynamical exponent $z = 3/2$ in the isotropic point.*
8. E. Ilievski, J. De Nardis, B. Wouters, J.-S. Caux, F. H. L. Essler and T. Prosen, *Complete generalized Gibbs ensembles in an interacting theory*, Phys. Rev. Lett. **115**, 157201 (2015). **194/264** citations. *Solving a long-standing problem of constructing complete generalized Gibbs ensembles in the quantum quench setup for an integrable XXZ spin chain in terms of local and quasi-local conserved charges. The paper established the importance of quasi-local charges in statistical mechanics of integrable systems.*
9. T. Prosen, *Exact Non-equilibrium Steady State of an Open Hubbard Chain*, Phys. Rev. Lett. **112**, 030603 (2014). **49/73** citations. *The first steady-state solution of boundary driven Hubbard model while proposing a novel non-equilibrium many-body concept of a walking-graph state.*

*Recommended with a commentary by R. Nandkishore, *A breakthrough in many body quantum chaos*, published in: Journal Club for Condensed Matter Physics June_2018_02

10. T. Prosen, *Open XXZ Spin Chain: Non-equilibrium Steady State and a Strict Bound on Ballistic Transport*, Phys. Rev. Lett. **106**, 217206 (2011). **271/365** citations. *The first explicit solution of a strongly interacting quantum chain weakly coupled to a pair of dissipative baths at the ends; a ‘side result’ yields a novel quasi-local conserved operator of XXZ chain and rigorously answers a long-standing debate on strict positivity of the high-temperature spin Drude weight.*

Selected ten (10) invited recent presentations to internationally established conferences, advanced schools or workshops (In this period Prosen has about 8-10 invited talks at international events per year):

1. Invited talk at the ‘March Meeting’ of American Physical Society (APS) 2019, Boston, USA, 7/3/2019 (the largest in a broad sense condensed-matter physics conference worldwide)
2. Invited talk at Winter conference *Many-Body Quantum Chaos*, Aspen Center for Physics, Aspen, USA, 10-15/3/2019
3. Invited speaker at NORDITA program *Bounding Transport and Chaos in Condensed Matter and Holography*, Stockholm, Sweden, 4/9/2018
4. Invited speaker at the KITP program *Novel Approaches to Quantum Dynamics*, Santa Barbara, USA, 30/8/2018
5. Invited lecture course in Les Houches Summer School *Integrability in Atomic and Condensed Matter Physics*, Les Houches, France, 30/7-24/8/2018
6. Invited talk at the 22nd Itzykson Conference, Paris Saclay, France, 6-8/6/2017
7. Invited lecture course in SFT2017 – *Lectures in Statistical Field Theory*, Galileo Galilei Institute for Theoretical Physics, Florence, Italy, 6-7/2/2017
8. Invited talk at the conference STATPHYS 26, Lyon, France, 18-22/7/2016 (the largest and most important conference in statistical physics, taking place every 3years)
9. Invited speaker at the Isaac Newton Institute program *Mathematical aspects of quantum integrable models in and out of equilibrium*, Cambridge, UK, 13/1/2016
10. Invited talk at the workshop *Tensor Networks and Simulations*, UC Berkeley: Simons institute for the theory of computing, Berkeley, USA, 21-25/4/2014

Selected three (3) international conferences organized by Prosen:

1. “Workshop on Ordering and Dynamics of Correlated Quantum Systems”, Evora, Portugal, 21-25/10/2019, <http://www.odcqs.uevora.pt/index.php>, ≈ 120 participants
2. “Integrable and Chaotic Quantum Dynamics: from Holography to Lattice”, Bled, Slovenia, 3-9/6/2018, <https://chaos.fmf.uni-lj.si/workshop/>, ≈ 35 participants
3. “Quantum and Classical Chaos: What comes next?”, Ljubljana, Slovenia, 9-11/10/2014, <http://www.camtp.uni-mb.si/camtp/anniversary/>, ≈ 35 participants

In recent years, Prosen has also contributed several articles in the leading Slovenian newspaper, Delo, on popularizing the main concepts of quantum physics, in particular related to quantum information and quantum computers. He also co-authored two radio-shows, one on “Chaos theory” and one on “Quantum computers” in the series “Frekvenca X” on the most popular Slovenian (national) radio station (‘Val 202’), and gave a 30min national radio interview (on ‘classical’, 3rd channel of national radio – ‘radio ARS’) about his work.