Tomaž Prosen — Curriculum Vitae

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 (PhD): 27 June 1995, Department of Physics, University of Ljubljana (UL)
- 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, UL; early invited appointment based on exceptional procedure according to the statute of University
- From January 2004: Associate professor, Faculty of mathematics and physics, Department of physics, UL; early invited appointment
- From October 1999: Assistant professor, Faculty of mathematics and physics, Department of physics, UL
- From February 1996: Research and teaching assistant, Faculty of mathematics and physics, Department of physics, UL
- 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, Visiting CNRS professor, Institut Henri Poincaré, Paris;
  March–August 2010, March/April 2011, Bessel awardee (Humboldt foundation) University of Potsdam;
  October 2020 (1m), Visiting professor at Sorbonne University, Institut Henri Poincaré, Paris
- Other longer research stays: UNAM Mexico, 01-05/1999 (4 m), Los Alamos National Lab, USA, 05-06/1999 (2 m), Max Planck Institut for Nuclear Physics, Heidelberg, 10-12/1999 (3 m)

Fellowships and awards

- May 2022: Awarded "Physikpreis Dresden" 2022 (joint prize of MPI PKS and TU Dresden, 1 per year)
- 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 plaquette" 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 (13): Marko Žnidarič (professor, 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 (assist. professor, computer science dept., UL), * Enej Ilievski (senior researcher, UL), * Berislav Buča (postdoc, Oxford), * Marko Medenjak (Ambizione fellow, Geneva), * Lenart Zadnik (postdoc, Paris Sud), * Ivan Kukuljan (postdoc, MPIQO Garching), * Katja Klobas (Marie Curie fellow, Oxford); * Pavel Kos (postdoc, MPIQO Garching); 2 ongoing PhD students (Žiga Krajnik, Yusuf Kasim)
- Current and past postdocs (12) – with brackets those who secured permanent positions in academia: Ulysse Godreau [from 09/22], Bruno Bertini (lecturer, Univ. Nottingham; won URF of Royal Society 2020), Spyros Sotiriadis (ass. prof., Univ. Crete), Marton Mestyan, Felix Fritzsch, Mathieu Vanicat, Szabolcz Vajna, Mariya Medvedyeva, Luca Ferialdi (Univ. Trieste), Ugo Marzolino (INFN, Trieste), Humberto Lemos (UFSF, Brasil), Gregor Veble (ass. prof. Univ. Nova Gorica; on leave)

Organisation of scientific meetings

- For (selected) three international meetings organised by Prosen, see Track record
- Prosen is the founding organiser of a regular *Seminar in mathematical physics* at the home institution (since 2008)

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 Phyisikalische 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 international collaborations

* G. Casati and G. Benenti, University of Insubria, Como, Italy, *Quantum chaos, nonlinear dynamics*; * T. H. Seligman, Instiute 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 Wroclaw, 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. P. Garrahan, University Nottingham, UK, *Exactly solvable stat.-mech. of cellular automata*; * G. Akemann, University Bielefeld, Germany, *Random matrix theory*; * V. Pasquier, CEA-Saclay, France, *Integrable systems out of equilibrium*

10-Year Track-Record

Bibliometrics as of May 2022: **243** refereed original scientific publications, most with 1-3 authors, all with 6 or less authors; out of which **37** are *single author* papers (**8** in the last 10 years)
Web of Science: **9150** citations in total (**7917** without self citations), Hirsch index $h = \mathbf{52}$,
7 'Highly Cited Papers', **2** 'Hot Papers'
Google Scholar: **13384** citations, Hirsch index $h = \mathbf{64}$
Journals most frequently published in: *Physical Review Letters*: **52** articles (**5** *single author* PRLs), *Journal of Physics A: Math. Theor. (Math. Gen., until 2006)*: **47** articles, *Physical Review E*: **33** articles...
Publications in other top journals in the field: *Physical Review X*: **4** articles, *Commun. Math. Phys.* **3** articles, *Nature Commun.* **1** article...

Ten (10) selected recent important publications of Prosen as a senior (or leading) author:

1. B. Bertini, F. Heidrich-Meisner, C. Karrasch, T. Prosen, R. Steinigeweg, M. Žnidarič, *Finite-temperature transport in one-dimensional quantum lattice models*, Rev. Mod. Phys. **93**, 025003 (2021). **44/117** citations (source: **Web of Science/Google Scholar**). *Review article – key contributions in the last ∼10 years by Prosen to the field that is reviewed.*
2. B. Bertini, P. Kos, T. Prosen, *Random matrix spectral form factor of dual-unitary quantum circuits*, Commun. Math. Phys. **387**, 597 (2021). **5/22** citations. *Proof of random matrix spectral form factor for a general family of disordered Floquet dual-unitary circuits at all time scales, in the thermodynamic limit.*
3. 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). **50/90** citations. *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 into distinct ergodic behaviours.*
4. K. Klobas, M. Medenjak, T. Prosen, M. Vanicat, *Time-dependent matrix product ansatz for interacting reversible dynamics*, Commun. Math. Phys. **371**, 651 (2019). **22/34** 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.*
5. M. Ljubotina, M. Žnidarič and T. Prosen, *Kardar-Parisi-Zhang physics in the quantum Heisenberg magnet*, Phys. Rev. Lett. **122**, 210602 (2019). **57/93** 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.*
6. 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).* **89/146** citations. *The first exact computation of random matrix spectral form factor in a locally interacting quantum lattice model, developing a novel transfer matrix method.*
7. P. Kos, M. Ljubotina and T. Prosen, *Many-body quantum chaos: Analytic connection to random matrix theory*, Phys. Rev. X **8**, 021062 (2018).* **80/120** 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.*
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). **249/346** citations. *Solving a long-standing problem of constructing complete generalized Gibbs ensembles in the quantum*

*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

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). **59/87** citations. *The first steady-state solution of a boundary driven Hubbard model while proposing a novel non-equilibrium many-body ansatz of a walking-graph state.*
10. T. Prosen, *Quasilocal conservation laws in XXZ spin-1/2 chains: Open, periodic and twisted boundary conditions*, Nucl. Phys. B **886**, 1177 (2014). **70/93** citations. *The complete characterization of quasi-local conservation laws (charges) for the easy-plane anisotropic Heisenbergs spin 1/2 chain (XXZ model), that have first been proposed by Prosen in 2011, for various types of (including periodic) boundary conditions. The work also elaborates a systematic procedure of computing the complete (saturated) lower bound on 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 10-12 invited talks at international events per year):

1. Keynote speaker at the MECO47, 47th conference of the Middle European Cooperation in Statistical Physics, Erice Italy, 12-16/06/2022
2. 'Physikpreis Dresden', Award Coloquium, 24/05/2022, Technical University Dresden, Dresden Germany
3. Invited talk at the 'March Meeting' of American Physical Society (APS) 2022, Chichago USA, 17/3/2022 (the largest in a broad sense condensed-matter physics conference worldwide)
4. Invited lecture course on 'Many-body quantum chaos' in the School on Statistical-Field-Theory (SFT-Paris-2019), Institut Henri Poincaré, Paris France, 16-27/09/2019
5. Invited talk at the 'March Meeting' of American Physical Society (APS) 2019, Boston USA, 7/3/2019
6. Invited speaker at the KITP program *Novel Approaches to Quantum Dynamics*, Santa Barbara USA, 30/8/2018
7. Invited lecture course in Les Houches Summer School *Integrability in Atomic and Condensed Matter Physics*, Les Houches France, 30/7-24/8/2018
8. Invited talk at the 22nd Itzykson Conference, Paris Saclay, France, 6-8/6/2017
9. Invited lecture course in SFT2017 – *Lectures in Statistical Field Theory*, Galileo Galilei Institute for Theoretical Physics, Florence Italy, 6-7/2/2017
10. Invited talk at the conference STATPHYS 26, Lyon France, 18-22/7/2016 (the principal conference in statistical physics, taking place every 3years)

Selected three (3) recent international conferences organized by the PI:

1. Workshop "Integrable and Chaotic Dynamics", Pokljuka, Slovenia, 8-9/7/2022, `https://chaos.fmf.uni-lj.si/pokljuka22` ≈ 40 participants
2. Workshop/Conference "Ordering and Dynamics of Correlated Quantum Systems", Evora, Portugal, 21-25/10/2019, `http://www.odcqs.uevora.pt/index.php`, ≈ 120 participants
3. Workshop "Integrable and Chaotic Quantum Dynamics: from Holography to Lattice", Bled, Slovenia, 3-9/6/2018, `https://chaos.fmf.uni-lj.si/workshop/`, ≈ 35 participants

Prosen is a recipient of *PhysikPreis Dresden* (2022), the *Wilhelm Friedrich Bessel Award* of the Alexander von Humbold Foundation (2009), and of the highest rank national (Slovenian) award for scientific achievements (*Zois Prize* 2005). Since 2014, the Prosen has been a member of European Academy of Sciences and Arts (Salzburg).

Prosen has also contributed numerous 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.