

Curriculum Vitae

Personal information:

Name: Yaroslav Vorobets
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Education and degrees:

1988–90: Lviv State University, Lviv, Ukraine;
1990–97: Moscow State University, Moscow, Russia.
M.S. in Mathematics: 1994, Moscow State University (diploma with honors);
Ph.D. in Mathematics: 1998, Moscow State University.
Ph.D. thesis “Periodic trajectories of billiards in polygons and geodesic flows on surfaces with flat structures”, advisor Anatoli Stepin.

Professional experience:

Since 2009: Texas A&M University, Associate Professor;
2006–2009: Texas A&M University, Assistant Professor;
2005–2006: Texas A&M University, Research Assistant;
2005–2006: Clay Mathematics Institute, Research Scholar;
June–July 2004: Max Planck Institute for Mathematics in Bonn, Visiting Scholar (within the MPIM program on algebraic and topological dynamics);
2002–2006: Pidstryhach Institute for Applied Problems of Mechanics and Mathematics of Ukrainian NAS, Senior Scientific Researcher;
1998–2002: Lviv Ivan Franko National University, Scientific Researcher.

Teaching experience:

Since 2006: Texas A&M University.

Courses taught:

- MATH 304 (Linear Algebra) in 2007–2008, 2010–2012, 2014 and 2017,
- MATH 311 (Linear Algebra and Vector Calculus) in 2007–2009, 2015–2020 and 2022,
- MATH 323 (Linear Algebra) in 2013 and 2022–2023
- MATH 423 (Linear Algebra II) in 2012,
- MATH 415 (Modern Algebra I) in 2021–2022,
- MATH 433 (Applied Algebra) in 2010, 2015, 2019 and 2023–2024,
- graduate distance course MATH 662 (Abstract Algebra) in 2021 and 2023,
- MATH 409 (Advanced Calculus I) in 2013 and 2020,
- MATH 412 (Theory of Partial Differential Equations) in 2006,

- graduate course MATH 614 (Dynamical Systems and Chaos) in 2014, 2016 and 2018.

Course development: developed a graduate course on Dynamical Systems and Chaos (<https://people.tamu.edu/~yvorobets/MATH614-2018A/>).

Graduate advising: took part in advising the following graduate students (not a chair or co-chair of their graduate committees): M. G. Benli, R. Kogan, S. Samarakoon.

Membership:

American Mathematical Society (since 2007).

Shevchenko Scientific Society (since 2008).

Grants, awards and honors:

NSF grant DMS-0701298, 2007–2010.

Clay Research Scholarship, 2005–2006.

Soros Graduate Student, 1995.

Research interests:

Geometric group theory:

- self-similar groups and groups defined by finite automata,
- the Grigorchuk groups,
- ample (topological full) groups.

Ergodic theory:

- substitution subshifts,
- symbolic dynamics and coding,
- uniform distribution of orbits of finitely generated transformation groups,
- Ramsey treatment of symmetry.

Dynamical systems:

- billiard flows, especially in polygons,
- interval exchange transformations,
- geodesic flows on surfaces with flat structure,
- the Veech surfaces (flat surfaces with a rich group of affine symmetries),
- moduli spaces of flat surfaces.

Computer science:

- finite automata, their use in group theory and symbolic dynamics,
- formal languages.

Research papers:

1. Automatic logarithm and associated measures (with R. Grigorchuk and R. Kogan). *Algebra Discrete Math.* **34** (2022), no. 1, 22–67.
2. On Mealy-Moore coding and images of Markov measures (with R. Grigorchuk and R. Kogan). *Trans. Moscow Math. Soc.* **82** (2021), 89–115.
3. On the commutator group of the group of interval exchange transformations. *Proc. Steklov Inst. Math.* **297** (2017), 1–12.
4. On growth of random groups of intermediate growth (with M. G. Benli and R. Grigorchuk). *Groups Geom. Dynamics* **8** (2014), no. 3, 643–667.
5. Notes on the Schreier graphs of the Grigorchuk group. In *L. Bowen et al. (eds.), Dynamical systems and group actions*, 221–248. Contemp. Math. **567**, Amer. Math. Soc., Providence, RI, 2012.
6. Automata generating free products of groups of order 2 (with D. Savchuk). *J. of Algebra* **336** (2011), 53–66.
7. Automata over a binary alphabet generating free groups of even rank (with B. Steinberg and M. Vorobets). *Int. J. of Algebra and Comput.* **21** (2011), nos. 1–2, 329–354.
8. On a substitution subshift related to the Grigorchuk group. *Proc. Steklov Inst. Math.* **271** (2010), 306–321.
9. Fermat’s spiral and the line between Yin and Yang (with T. Banakh and O. Verbitsky). *Amer. Math. Monthly* **117** (2010), no. 9, 786–800.
10. On a series of finite automata defining free transformation groups (with M. Vorobets). *Groups Geom. Dynamics* **4** (2010), no. 2, 377–405.
11. On a free group of transformations defined by an automaton (with M. Vorobets). *Geom. Dedicata* **124** (2007), 237–249.
12. Periodic geodesics on generic translation surfaces. In *S. Kolyada et al. (eds.), Algebraic and topological dynamics*, 205–258. Contemp. Math. **385**, Amer. Math. Soc., Providence, RI, 2005.
13. On the uniform distribution of orbits of finitely generated groups and semigroups of plane isometries. *Sb. Math.* **195** (2004), no. 2, 163–186.
14. Actions of finitely generated groups and semigroups on a plane by means of isometries. *Math. Notes* **75** (2004), no. 4, 489–512.
15. On faithful actions of groups and semigroups by orientation-preserving plane isometries. *Algebra Discrete Math.* No. 4 (2003), 118–125.
16. A Ramsey treatment of symmetry (with T. Banakh and O. Verbitsky). *Electron. J. Comb.* **7** (2000), no. 1. Research paper R52, 25 p.
17. Ramsey problems for spaces with symmetries (with T. O. Banakh and O. V. Verbitsky). *Izv. Math.* **64** (2000), no. 6, 1091–1127.
18. On the uniform distribution of orbits of free group and semigroup actions on a plane. *Proc. Steklov Inst. Math.* **231** (2000), 59–89.
19. Isospectrality and Galois projective geometries (with A. M. Stepin). *Math. Notes* **63** (1998), no. 5, 582–585.
20. Billiards in rational polygons: periodic trajectories, symmetries and d-stability. *Math. Notes* **62** (1997), no. 1, 56–63.

21. Ergodicity of billiards in polygons. *Sb. Math.* **188** (1997), no. 3, 389–434.
22. Asymptotics of the spectrum of the Laplace-Beltrami operator on tori with Liouville and infra-Liouville metrics. *Russ. Math. Surv.* **52** (1997), no. 2, 430–431.
23. Planar structures and billiards in rational polygons: the Veech alternative. *Russ. Math. Surv.* **51** (1996), no. 5, 779–817.
24. Ergodicity of billiards in polygons: Explicit examples. *Russ. Math. Surv.* **51** (1996), no. 4, 756–757.
25. Planar structures and billiards in rational polygons. *Russ. Math. Surv.* **51** (1996), no. 1, 177–178.
26. On the measure of the set of periodic points of the billiard. *Math. Notes* **55** (1994), no. 5, 455–460.
27. Periodic billiard trajectories in polygons: Birth mechanisms (with G. A. Gal’perin and A. M. Stepin). *Russ. Math. Surv.* **47** (1992), no. 3, 5–80.
28. Periodic billiard trajectories in polygons (with G. A. Gal’perin and A. M. Stepin). *Russ. Math. Surv.* **46** (1991), no. 5, 204–205.

Other publications:

1. Anatolii Mikhailovich Stepin (obituary) (with O. N. Ageev et al.). *Uspekhi Mat. Nauk* **77** (2022), no. 2, 189–194.

Preprints:

1. On maximal subgroups of ample groups (with R. Grigorchuk), 57 pages (<https://arxiv.org/abs/2403.16364>).
2. On the topological full group containing the Grigorchuk group, 15 pages (<https://arxiv.org/abs/2007.06789>).

Current research projects:

1. The topological full group of Lysënok’s subshift and groups of intermediate growth.
2. Dynamics of the renormalization map related to the spectrum of the Grigorchuk group.
3. Spectral properties of transformation groups generated by certain finite automata (Lamplighter, Aleshin, Bellaterra etc.).
4. Dual groups and semigroups of self-similar groups.
5. Self-similar measures and hierarchical codes.
6. The Koszul algebras and one-dependent processes.
7. The Thue-Morse system and the Grigorchuk-Erschler group.
8. Maximal subgroups of ample groups (in particular, topological full groups of Cantor minimal systems).
9. Uniformly recurrent subgroups of ample groups.

Talks on conferences:

Groups and dynamics workshop, College Station, TX, March 2024.

International conference “At the End of the Year 2022”, Kyiv, Ukraine, December 2022.

International Conference “Applied Mathematics and IT”, Chernivtsi, Ukraine, September 2022.

International Conference “Geometric and Asymptotic Group Theory with Applications”, Hoboken, NJ, July 2022.

International Conference “Ergodic Theory and its Connections”, Houston, TX, May 2022.

International conference “At the End of the Year 2021”, Kyiv, Ukraine, December 2021.

International conference “Kyiv Algebra 60”, Kyiv, Ukraine, July 2020.

Joint Mathematics Meeting, San Antonio, TX, January 2015.

Rice Dynamics Meetings, Houston, TX, May 2013.

Groups, geometry, and random structures, College Station, TX, March 2012.

Applied inverse problems conference, College Station, TX, May 2011.

Group actions on measure spaces, College Station, TX, March 2011.

Self-similarity and branching in group theory, Banff, Canada, October 2008.

AMS sectional meeting #1033, section on billiards and related topics, Murfreesboro, TN, November 2007.

Geometric groups on the Gulf coast, New Orleans, LA, January 2007.

Self-similar groups and conformal dynamics, Palo Alto, CA, June 2006.

Geometric and probabilistic methods in group theory and dynamical systems, College Station, TX, November 2005 (plenary talk).

ESF exploratory workshop “Dynamical systems: from algebraic to topological dynamics”, Bonn, Germany, July 2004 (plenary talk).

Dynamics in the Teichmüller space and applications to rational billiards, Luminy, France, July 2003 (plenary talk).

International conference on group theory: combinatorial, geometric, and dynamical aspects of infinite groups, Gaeta, Italy, June 2003.

Conference on functional analysis and its applications dedicated to the 110th anniversary of Stefan Banach, Lviv, Ukraine, May 2002.

International conference dedicated to the 90th anniversary of L. S. Pontryagin, Moscow, September 1998.

Workshop on one-dimensional dynamics, Warsaw, October 1997.

Polish-German workshop on ergodic theory and dynamical systems, Szklarska Poreba, Poland, September 1997.

Research seminar talks:

TAMU Groups and Dynamics seminar (regular talks since 2005); latest talk “Maximal subgroups of ample (topological full) groups” in March 2023.

International seminar dedicated to the 95th anniversary of I. F. Grygorchuk, February 2022.

Rice University mathematics seminar, January 2006 and October 2011.

TAMU Mathematical Physics and Harmonic Analysis seminar, October 2005 and September 2008.

Steklov Institute of Mathematics seminar on dynamical systems, February 1998.

University of Warsaw mathematics seminar, October 1997.

Moscow State University seminars on ergodic theory and dynamical systems (multiple talks in 1995–1997), and on differential geometry (1997).

Professional activities:

Refereed papers for the following journals: “Ergodic Theory and Dynamical Systems”, “Geometriae Dedicata”, “Journal of Modern Dynamics”, “Sbornik. Mathematics”.

Co-editor, Volume 567 of the AMS Contemporary Mathematics series.

Co-organizer, Conference on Geometric and Probabilistic Methods in Group Theory and Dynamical Systems, College Station, TX, November 2015.

Member of the Award Committee of the mathematics competition for young mathematicians in Ukraine sponsored by Shevchenko Sci. Soc. and the U.S.-Ukraine Foundation.

Departmental activities:

Member of the Postdoc Committee, 2012–2014.

Member of the TT Teaching Committee, 2021–2023.

Outreach activities:

TAMU High School Mathematics Contest (exam writing and proofreading, power team exam grading), 2018–present.

TAMU Mathematics and Statistics Fair, 2017–present.