NIKOLAY BOGACHEV

PERSONAL

First name: Nikolay   **Surname:** Bogachev

Languages: Russian (native), English (fluent), German (intermediate)

RESEARCH INTERESTS

Geometry and topology of hyperbolic orbifolds and manifolds, arithmetic groups and number theory, geometry and dynamics of discrete groups, discrete subgroups of Lie groups, geometric group theory, applications of geometry and topology to machine learning and computer science

EMPLOYMENT HISTORY

CURRENT POSITIONS

- **Assistant Professor**   *Aug 2023 – Aug 2026*
  University of Toronto, Canada
  Department of Mathematics

- **Postdoctoral Fellow**   *Feb 2023 – Aug 2023*
  University of Toronto, Canada
  Department of Mathematics
  Host: Prof. Askold Khovanskii

POSITIONS HELD

1. **Research Scientist**   *Nov 2021 — Nov 2022*
   Institute for Information Transmission Problems, Moscow, Russia
   The Laboratory of Algebra and Number Theory
   Head: Prof. Michael Tsfasman

2. **Assistant/Associate Professor**   *Nov 2019 – Sep 2022*
   Moscow Institute of Physics and Technology, Moscow, Russia
   Department of Discrete Mathematics
   Head: Prof. Andrei Raigorodskii

3. **Research Scientist**   *Oct 2019 – Sep 2022*
   The Laboratory of Combinatorial and Geometric Structures
   Moscow Institute of Physics and Technology, Moscow, Russia
   Head: Prof. Janos Pach

4. **Research Scientist (Postdoc)**   *Nov 2019 – Nov 2021*
   The Center for Advanced Studies, Skoltech, Moscow, Russia
   Head: Prof. Igor M. Krichever

5. **Lecturer,**   *Sep 2016 – Nov 2019*
   Moscow Institute of Physics and Technology, Moscow, Russia
   Department of Discrete Mathematics
   Head: Prof. Andrei Raigorodskii

6. **Researcher**   *Dec 2015 – Feb 2017*
   JSC Infotecs, Moscow, Russia
   Geometric and algebraic applications;
   software implementations of number-theoretical algorithms

7. **Teaching Assistant**   *Sep 2014 — Jun 2015*
   The Center of online education "Foxford", Moscow, Russia
   Methodist and teaching assistant for geometric and olympiad's courses

8. **School Teacher in Mathematics**   *Feb 2010 — Apr 2016*
   High (Secondary) School no. 54, Moscow, Russia
   Classes: Geometry, Algebra, Olympiad Mathematics

RESEARCH VISITING POSITIONS

1. **Weizmann Institute of Science,** 2 months visit   *Dec 2022 – Feb 2023*
   Rehovot, Israel
   Host: Prof. Alex Lubotzky

2. **IHES – Institut des Hautes Études Scientifiques,** 2 months visit   *Oct 2022 – Dec 2022*
   Bures-sur-Yvette, France
   Host: Dr. Fanny Kassel

3. **IHES – Institut des Hautes Études Scientifiques,** 3 months visit   *Dec 2019 – Feb 2020*
   Bures-sur-Yvette, France
   Host: Dr. Fanny Kassel

4. **IHES – Institut des Hautes Études Scientifiques,** 1 month visit   *Apr 2019*
   Bures-sur-Yvette, France
   Host: Dr. Fanny Kassel

5. **University of Bielefeld, Germany,** 1 month visit   *June 2015*
   Department of Mathematics, Visiting Researcher
   Host: Prof. Michael Roeckner

EDUCATION

1. **Ph.D. in Mathematics**   *March 2019*
   Higher School of Economics, Moscow, Russia
   Thesis: "Reflective hyperbolic lattices"
   Advisor: Prof. Ernest B. Vinberg

2. **Postgraduate study**   *2014 – 2018*
   Lomonosov Moscow State University, Moscow, Russia
   Thesis: "Reflective hyperbolic lattices"
   Advisor: Prof. Ernest B. Vinberg

3. **M.Sc. in Mathematics cum laude**   *2009 – 2014*
   Lomonosov Moscow State University
   The Faculty of Mechanics and Mathematics
   Advisor: Prof. Ernest B. Vinberg

AWARDS

1. **Prize for young mathematicians of Russia**   *2021*
   Category "Young scientists under 35"
   All-Russian conference of mathematicians, Sochi, Sirius
   The president of the committee: Prof. Andrei Okounkov

2. **Simons Foundation Prize**   *2017, 2018*
   The competition of grants for PhD-students in mathematics

PUBLICATIONS

PREPRINTS

1. N. Bogachev, S. Douba   **2023**
Geometric and arithmetic properties of Löbell polyhedra, arXiv:2304.12590.

2. M. Belolipetsky, N. Bogachev, A. Kolpakov, and L. Slavich   **2021**
Subspace stabilisers in hyperbolic lattices, arXiv:2105.06897.

3. N. Bogachev, A. Kolpakov   **2021**
Thin hyperbolic reflection groups, arXiv:2112.14642

PUBLISHED/ACCEPTED ARTICLES

4. N. Bogachev, A. Kolpakov, and A. Kontorovich   **2022**
Kleinian sphere packings, reflection groups, and arithmeticity, arXiv:2203.01973
to appear in **Math. of Comp.**

5. S. Alexandrov, N. Bogachev, A. Egorov, and A. Vesnin   **2021**
On volumes of hyperbolic right-angled polyhedra, arXiv:2111.08789
Sbornik: Math.

6. N. Bogachev   **2020**
From geometry to arithmetic of compact hyperbolic Coxeter polytopes, arXiv:2003.11944
Transformation Groups.

7. D. Baranchuk, N. Bogachev, Y. Demidovich, A. Kolpakov, and L. Prokhorenkova   **2022**
Graph-based Nearest Neighbor Search in Hyperbolic Spaces
ICLR 2022.

8. N. Bogachev, A. Kolpakov   **2020**
On faces of quasi-arithmetic Coxeter polytopes
Int. Math. Res. Not. — IMRN, Vol. 2021 (2021), No. 4, pp. 3078–3096

9. N. Bogachev   **2019**
On classification of stably reflective hyperbolic $\mathbb{Z}[\sqrt{2}]$-lattices of rank 4
Doklady Math., 2019, Vol. 486:1, pp. 7–11.

10. N. Bogachev, A. Perepechko   **2018**
Vinberg's Algorithm for Hyperbolic Lattices
Math. Notes, Vol. 103:5 (2018), p. 836–840, DOI: [10.4213/mzm11889](10.4213/mzm11889)

11. N. Bogachev   **2019**
Classification of (1,2)-reflective anisotropic hyperbolic lattices of rank 4
Izvestiya Math., 2019, 83:1, pp. 3–24.

12. N. Bogachev   **2017**
Reflective anisotropic hyperbolic lattices of rank 4
Russian Math. Surveys, 2017
Vol. 1, pp. 193 – 194 (transl. from Russian), DOI: [10.1070/RM9756](10.1070/RM9756)

UNPUBLISHED NOTES

13. N. Bogachev   **2016**
Reflective anisotropic hyperbolic lattices of rank 4, arXiv:1610.06148.

Tools & Algorithms

14. N. Bogachev   **2020**
`SmaRBA:` *Small Ridges, Bounds and Applications*
SageMath worksheet, GitHub: SmaRBA.ipynb.

15. N. Bogachev, A. Kolpakov   **2020**
`PLoF:` *Polytope's lower-dimensional faces*
SageMath worksheet, GitHub: https://github.com/sashakolpakov/plof.

16. N. Bogachev, A. Perepechko   **2017**
`VinAl:` *Vinberg's Algorithm*
GitHub: https://github.com/aperep/vinberg-algorithm, DOI: 10.5281/zenodo.1098448.

FUNDING AND GRANTS

SELECTED INVITED LECTURES AND TALKS

Conferences & Workshops

1. Conference "Groups Around 3-Manifolds" (invited speaker)   **June 2023**
Montreal, Canada

2. All-Russian conference of international mathematical centers   **Aug 2021**
(Prize Winner; Invited sectional speaker)
University of Sirius, Sochi, Russia

3. The 7th Chinese-Russian Conference on Knot Theory and Related Topics   **Dec 2020**
(Plenary Speaker)
Bejing — Moscow, Online via Zoom

4. **Workshop "Arithmetic reflection groups and crystallographic packings"**   **Dec 2020**
   (invited speaker)
   American Institute of Mathematics, San Jose, California, USA

5. **Conference "Automorphic Forms and Algebraic Geometry"**   **May 2018**
   Steklov Mathematical Institute, St. Petersburg branch, St. Petersburg, Russia

SEMINARS & COLLOQUIUM

6. **Algebra Seminar**   **March 2023**
   University of Ottawa, Canada

7. **Hyperbolic Lunch seminar by Prof. Kasra Rafi**   **March 2023**
   University of Toronto, Canada

8. **Groups and Dynamics seminar**   **Jan 2023**
   Hebrew University of Jerusalem, Israel

9. **Geometry and Dynamics seminar**   **Jan 2023**
   Tel Aviv University, Israel

10. **Geometry and Topology seminar**   **Jan 2023**
    Technion, Haifa, Israel

11. **Algebra seminar**   **Jan 2023**
    University of Haifa, Israel

12. **Midrasha on group theory**   **Jan 2023**
    Weizmann Institute of Science, Rehovot, Israel

13. **Seminar "Group Theory"**   **Dec 2022**
    École Normale Supérieure, Paris, France

14. **Geometry & Dynamics seminar**   **Nov 2022**
    Paris-Saclay University, Orsay, France

15. **Seminar "Géométrie Dynamique"**   **Oct 2022**
    University of Lille, France

16. **The I. R. Shafarevich seminar of departments of algebra and algebraic geometry**   **Feb 2022**
    Steklov Math. Institute, Moscow, Russia

17. **Meetings of the Moscow Mathematical Society**   **Nov 2021**
    Moscow State University, Moscow, Russia

18. **Rutgers Math Department Colloquim**   **Apr 2021**
    Rutgers University, USA

19. **Seminar "Group Theory"**   **Feb 2020**
    École Normale Supérieure, Paris, France

20. **Seminar "Géométrie Dynamique"**   **Apr 2019**
    University of Lille, France

SERVICE TO THE PROFESSION

Refereeing and quick opinions for journals

J. Alg. Combinatorics, Disc. Comp. Geom., Exp. Math., Israel J. Math., St. Petersburg J. Math., Transformation Groups

Conferences / workshops / seminars organised

- **The Vinberg Distinguished Lecture Series:** an international online seminar organized with A. Kolpakov and A. Kontorovich, <https://amathr.org/vinberg/>

- **A conference "Geometry, arithmetic, and dynamics of discrete groups",** was planned to be held in Moscow, but cancelled because of the war; organized with M. Belolipetsky, A. Felikson, A. Kolpakov, A. Kontorovich

- **Research/Educational seminar "Algebra, geometry, and topology"** for my research group in Moscow Institute of Physics and Technology