CURRICULUM VITAE

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CURRENT POSITION

Professor, Dolciani Chair, Department of Mathematics and Statistics, Hunter College, CUNY
Professor, CUNY Graduate Center

DEGREES:

Dr.Sc. in Mathematics (Habilitation): Algorithmic problems for groups and Lie algebras , Moscow Steklov Institute, Russia, 1990.
Ph.D. in Mathematics: Finitely presented solvable groups and Lie algebras, Leningrad State University, Russia, 1984.
M.Sc. in Mathematics, Ural State University, Ekaterinburg, Russia, 1980.

EMPLOYMENT RECORD:

1984-86 **Assistant Professor**, Dept. of Mathematics, Ural State Univ.
1986-90 **Docent (Associate Professor)**, Dept. of Mathematics, Ural State University
1990-91 **Visiting Scientist**, Dept. of Mathematics and Statistics, McGill University
1991-94 **Assistant Professor**, Dept. of Mathematics and Statistics, McGill University
1994-1999 **Associate Professor**, Dept. of Mathematics and Statistics, McGill University
1999 - 2012 **Professor**, Dept. of Mathematics and Statistics, McGill University
2011 - present **Professor, Dolciani Chair** Dept. of Mathematics and Statistics, Hunter College, CUNY

AWARDS AND HONORS

1980 Gold medal from the Soviet Academy of Sciences. (One such medal is awarded every two years to the best mathematics student in the Soviet Union.) This medal was awarded for my construction of finitely presented solvable group with undecidable word problem. This was a solution of the well known Novikov-Adian problem.

1984 Ural Mathematical Society Award (for the solution of the Malcev-Kargapolov problem posed in 1965).

1996 Krieger-Nelson Prize of the Canadian Mathematical Society.

2012 Marsden Fund Award of the Royal Society of New Zealand.

2014 Invited Talk at the International Congress of Mathematicians in Seoul.

2015 Malcev's Prize for Outstanding Contributions to Mathematical Sciences of the Russian Academy of Science (joint with A. Miasnikov), awarded for the series of papers on Model Theory in Algebra. This prize is awarded once every three years.

MOST SIGNIFICANT CONTRIBUTIONS TO RESEARCH

I. I showed (jointly with A. Myasnikov) that the elementary theory of a free associative algebra and of a group algebra of a torsion free hyperbolic group over any field is undecidable, and classified rings elementarily equivalent to a free associative algebra (a group algebra of a free group) in a wide class of rings. These results answer well known Malcev's questions.

II. I showed (jointly with A. Myasnikov) that the elementary theory of all non-abelian free groups coincide and that it is decidable. These results solved two large-scale problems in mathematics, Tarski's conjectures of 1945. (the first conjecture was independently proved by Z. Sela). We also proved the decidability of the theory of a torsion free hyperbolic group. Recently we described definable subsets in a free group and proved that if a proper subgroup of a torsion free hyperbolic group is definable, then it is cyclic, solving Malcev's problem from 1950.

III. Developing and extended use of algebraic geometry for groups that provides the necessary topological machinery as well as a method for transcribing geometric notions into the language of pure group theory. A simple algebraic description of finitely generated fully residually free groups (coordinate groups of irreducible algebraic varieties, later called "limit groups"). Embedding of finitely generated fully residually free groups into coordinate groups of NTQ systems. Algebraic geometry for groups introduced by Baum-

slag, Remeslennikov, Myasnikov and myself became now one of the new research directions in combinatorial group theory.

IV. Implicit function theorems for algebraic varieties corresponding to regular quadratic and NTQ systems over free groups. From model theoretic view-point the theorems claim existence of very simple Skolem functions for particular $\forall\exists$-formulas over free groups. While in algebraic geometry such results would be described as lifting solutions of equations into generic points.

V. Solution of a large list of algorithmic problems in finitely generated fully residually free groups. Proof (with co-authors) of NP-completeness of the satisfiability problem for quadratic equations in free and torsion-free hyperbolic groups.

VI. Classification of finitely presented groups acting freely on Λ-trees for arbitrary ordered abelian group Λ, this is a solution of the main problem in the Alperin and Bass program.

VII. Construction of a finitely presented 3-step solvable group with unsolvable word problem (solving Novikov-Adian's problem).

PUBLICATIONS

Two books and more than 70 papers are published or accepted. These are the most recent publications.

1. O. Kharlampovich, A. Myasnikov Tarski-type problems for free associative algebras, arXiv:1509.04112, 2016, to appear in J. of Algebra.

2. O. Kharlampovich, A. Myasnikov, Equations in Algebras, arXiv:1606.03617, 2016, to appear in the IJAC.

3. O. Kharlampovich, A. Myasnikov, M. Sapir, Algorithmically complex residually finite groups, to appear in the Bulletin of Mathematical Sciences

4. V. Diekert, O. Kharlampovich, A. Mohajeri; SLP compression for solutions of equations with constraints in free and hyperbolic groups. Internat. J. Algebra Comput. 25 (2015), no. 1-2, 81-111.

5. O. Kharlampovich, B. Khoussainov, and A. Myasnikov, From automatic structures to automatic groups, Groups, Geometry, Dynamics, 8 (2014), no. 1, 157-198.

6. O. Kharlampovich, A. Mohajeri, A. Taam, A. Vdovina, Quadratic Equations in Hyperbolic Groups are NP-complete, arXiv:1306.0941, Transactions of the AMS, electronically published Feb 13, 2017.

7. O. Kharlampovich, A. Myasnikov, Model theory and algebraic geometry in groups, non-standard actions and algorithmic problems, Proceedings of the Intern. Congress of Mathematicians 2014, Seoul, v. 2, invited lectures, 223-244.

8. O. Kharlampovich, A. Myasnikov, Decidability of the elementary theory of a torsion-free hyperbolic group, arXiv:1303.0760, submitted, being revised, 2014.

9. O. Kharlampovich and A. Myasnikov, Definable sets in a hyperbolic group, Intern. J. of Algebra and Computation, 23 (2013) no 1.

10. Olga Kharlampovich, Alexei Myasnikov, Denis Serbin, Actions, length functions, and non-archemedian words, IJAC, 2013, 2.

11. O. Kharlampovich, A. Myasnikov, Limits of relatively hyperbolic groups and Lyndon's completions, Journal of the European Math. Soc., Volume 14, Issue 3, 2012, pp. 659-680.

12. O. Kharlampovich, A. Myasnikov,V. Remeslennikov, D. Serbin, Groups with free regular length functions in $\mathbf{Z}^n$, Transactions of the AMS,364 (2012), no. 6, 2847-2882.

13. I. Bumagin, O. Kharlampovich, A. Miasnikov, Isomorphism problem for fully residually free groups, J. Pure and Applied Algebra, 208, 3, 2007, 961-977.

14. Kharlampovich, O., Miasnikov, A. G., Elementary theory of free non-abelian groups, Journal of Algebra , 302, Issue 2, 451-552, 2006.

15. Kharlampovich, O., Miasnikov, A. G., Implicit function theorem over free groups, J. Algebra, 290:1 (2005), 1–203.

16. O. Kharlampovich, A. Myasnikov, Irreducible affine varieties over a free group. II: Systems in row-echelon form and description of residually free groups, J. Algebra, V. 200, 517–570 (1998).

PLENARY TALKS: I gave more than 60 invited talks at different international conferences in the last five years. The following talks were given in the last two years:

1. IAS Women And Mathematics 2017, Series of four lectures, Free and hyperbolic groups, May 16-19, 2017.

2. Shanks Workshop: Geometric Methods in Group Theory (Vanderbilt U.) , April 23-24, 2016

3. Wayne University, Colloquium, April 28, 2016, " Equations in group rings".

4. Wesleyan University, Colloquium, April 25, 2016, " Equations in group rings".

5. Ekaterinburg, URFU, Russia, Colloquium, January 2016.

6. Lie and Jordan Algebras, their Representations and Applications VI, Dec 13-19, Brasil, 2015

7. Workshop on Groups and Semigroups, Porto, June 9, 2015

8. Conference GAGTA 2015 - Geometric and asymptotic group theory with applications, 17 sept. 2015 Marseille (France) , Tarski-type problems for group algebras

9. ALFA 15: Automata, Logic, Formal languages, Algebra June 15, 16, 17 2015, LaBRI, Bordeaux

10. Growth, Symbolic Dynamics and Combinatorics of Words in Groups, June 1-5, 2015, Paris, Elementary classification questions for free associative algebras and group rings.

11. ICM 2014, Seoul, Invited talk "Model theory and algebraic geometry in groups, non-standard actions and algorithmic problems" joint with A. Miasnikov.

12. Conference "Groups and algebras", Oaxaca, Mexico, Jan 25-30, 2015, " Elementary classification questions for groups and algebras".

13. Conference Geometry on groups and spaces, long session talk, KAIST, Daejeon, South Korea, August 9, 2014, plenary talk "Algorithmic problems for Gamma-limit groups".

14. Conference "Groups acting on trees and around", IHP, Paris, Feb 22-28, 2014, "Actions, length functions, and non-archemedian words" .

15. Manhattan Algebra Day, Dec 5, 2014, "Elementary classification problems in groups and algebras".

16. Conference " Geometry of computations in groups", Vienna, March 31-April 4, 2014," Gamma-limit groups".

17. Conference "Interactions between groups and algebras", Cuernavaca, Mexico, January 23-30, 2014, "Quadratic Equations in Hyperbolic Groups are NP-complete".

EDITORIAL WORK:

An editor of the International Journal of Algebra and Computation (since 1997).

RESEARCH GRANTS:

NSF Grant DMS-1201379 of $ 140,000 (2012-2015), PI;

NSF GAGTA conference grant of $25,000 (2014-2015);

PSC-CUNY award (2014-2016);

Marsden Fund Award of The Royal Society of New Zealand, 2012-2015, $ 335,000, PI;

Simons Foundation collaborative grant $35,000 for five years (2016-2021).

ADMINISTRATIVE AND OTHER PROFESSIONAL ACTIVITIES:

- I am a member of the steering committee of the GAGTA conferences (the last ones: Dusseldorf (2012) and NYC (2013), Newcastle (Australia), Lumini, France (2015), Hoboken (2016)).

- During the last five years I have been one of the organizers of the New York Group Theory Seminar at the Graduate Center CUNY that has about 50 participants. This is a world famous seminar where mathematicians talk about their research in group theory. It is the longest continuously running seminar in New York City (55 years). It was organized by W. Magnus, and was coordinated by G. Baumslag.

- I am organizing (together with L. Shneerson) GRECS seminar (Groups and Semigroups with Applications to Computer Science). The CUNY (Hunter College and Graduate Center) is well-known for a wide diversity of students who come from 150 countries with women students outnumbering men. The students who participate in the seminars as well as the students participating in the research under my supervision reflect this diversity. I am working with under-represented communities and encouraging young women mathematicians.

- I am co-organising a two week Women in Math program at the IAS in Princeton in 2017.

- I have refereed many grant proposals for NSERC and NSF and various papers for the Journal of Algebra, the Transactions of the AMS, Israel Math. Journal and other journals.

THESIS SUPERVISION

Eight students obtained PhD under my supervision, I am currently supervising two students. I supervised five postdoctoral fellows. In the last five years I was a thesis advisor of A. Taam (completed in Sept 2015), N. Touikan, J. Macdonald, A. Mohajeri, A-P. Grecianu. I am a thesis advisor of S. Heller. I was a postgraduate-scholar sponsor for D. Vavrichek and C. Reinfeldt.