

Atlantic Association for Research in the Mathematical Sciences  
Memorial University of Newfoundland  
Atlantic Algebra Centre

*AAC Mini Course*  
Growth of Groups and Related Topics  
will be delivered by



**Professor Rostislav Grigorchuk**

Department of Mathematics  
Texas A& M University, USA

Tue,	May 8,	2012,	MUN, room A1045,	1–2 pm,
Wed,	May 9,	2012,	MUN, room <b>A1049</b> ,	<b>12 noon – 1 pm,</b>
Thu,	May 10,	2012,	MUN, room A1045,	1–2 pm,
Fri,	May 11,	2012	MUN, room A1045,	1–2 pm

## ROSTISLAV GRIGORCHUK

Professor Grigorchuk was born on February 23, 1953 in Ternopol oblast, Ukraine. He received his undergraduate degree in 1975 from Moscow State University. He obtained a PhD (Candidate of Science) in Mathematics in 1978, also from Moscow State University, where his thesis advisor was A. M. Stepin. In 1980 he became a recipient of the Award of Moscow Mathematical Society. Grigorchuk received a habilitation (Doctor of Science) degree in Mathematics in 1985 at the Steklov Institute of Mathematics in Moscow. During the 1980s and 1990s, Rostislav Grigorchuk held positions at the Moscow State University of Transportation, and subsequently at the Steklov Institute of Mathematics and Moscow State University. In 2002 Grigorchuk joined the faculty of Texas A & M University as a Professor of Mathematics, and he was promoted to the rank of Distinguished Professor in 2008.

Rostislav Grigorchuk gave an Invited Address at the 1990 International Congress of Mathematicians in Kyoto, an AMS Invited Address at the March 2004 meeting of the American Mathematical Society in Athens, Ohio and a plenary talk at the 2004 Winter Meeting of the Canadian Mathematical Society.

In June 2003 an International Group Theory conference in honour of Grigorchuk's 50th birthday was held in Gaeta, Italy. Proceeding of that conference appeared as "Infinite Groups: Geometric, Combinatorial and Dynamical Aspects" (Progress in Mathematics) edited by Laurent Bartholdi, Tullio Ceccherini-Silberstein, Tatiana Smirnova-Nagnibeda, and Andrzej Zuk. In addition, special issues of the "International Journal of Algebra and Computation" and of the journal "Algebra and Discrete Mathematics" were dedicated to this anniversary.

Grigorchuk is the Editor-in-Chief of the journal "Groups, Geometry and Dynamics", published by the European Mathematical Society, and a member of the editorial boards of the journals "International Journal of Algebra and Computation", "Journal of Modern Dynamics", "Geometriae Dedicata", "Algebra and Discrete Mathematics", "Matematychni Studii" and "Ukrainian Math. Journal".

Professor Grigorchuk was a Fulbright professor at Columbia University in 1991. He also held appointments as a visiting professor at numerous other universities and institutions: Max Planck Institute, MSRI, IHES, ETH, École Normal Supérieure (Lyon), Universities Genève, Paris Sud (Orsay), Toulouse, Grenoble, Marseille, Neuchâtel, and others.

## ABSTRACT OF THE MINI COURSE

My mini-course will be devoted to the notion of the growth of finitely generated groups and related topics (random walks, spectra of groups and graphs, amenability, etc.). The concept was introduced independently by A. Schwarz and J. Milnor. The main problem about the existence of the groups whose growth is intermediate, that is, strictly greater than polynomial and strictly less than exponential was posed by J. Milnor in 1968. My course will be concentrated on this Milnor's Problem and some related topics. Some time will also be devoted to the discussion of the Gap Conjecture which was formulated by the speaker in his talk at the 1990 International Congress of Mathematicians in Kyoto.

I will start with some basic facts about the groups with polynomial or exponential growth. Then I will consider groups whose growth is intermediate between polynomial and exponential.

For the polynomial growth case, I will give a short survey of existing proofs of the remarkable theorem of Gromov (and its modifications), characterizing groups of polynomial growth as virtually nilpotent. In this connection I will mention the works of Van den Dries and Wiklie, B.Kleiner, and Shalom and Tau.

As for the exponential growth case, I will make a short overview of existing results showing when a group has exponential growth and tell the story of the solution of the Gromov's Problem about the groups of uniformly exponential growth.

The main part of the course will be devoted to the case of groups of intermediate growth, the first examples of which were constructed by the speaker in 1983. We will describe the main construction of such groups, and list several properties, which sometimes are quite unusual. We will also touch upon the topics of the actions on spherically homogeneous rooted trees, and of self-similar groups (or groups generated by the finite automata). Then we will mention some applications of these groups to such areas as the amenability, random walks, holomorphic dynamics, combinatorics and the theory of fractals.

*Everybody is invited! A limited support is available for the mathematics students in Atlantic Canada. Please provide a recommendation letter from your supervisor. Send applications to aac at mun.ca. Please also visit the website of AAC at [www.mun.ca/aac](http://www.mun.ca/aac).*