Boris Weisfeiler 1941-1985(???)

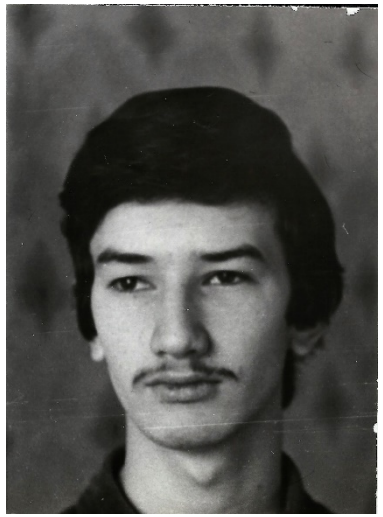
Life of mathematician, adventurer, and uncle

Who am I?

My name is Lev Weisfeiler

Boris Weisfeiler’s nephew

My mother Olga, Boris's younger sister, was not able to attend this conference



Boris Weisfeiler - Origins

Boris Weisfeiler was born in Moscow, USSR, on April 19, 1941

- Family was evacuated to Sverdlovsk in summer 1941

Mother was a doctor

Father was professor of microbiology in Anti-Tuberculosis Institute/Clinic

Father:
Jules Gyula Weiszfeiler (1902-1984)

Born in Brasov, then Austro-Hungary, now Romania

Grew up in Budapest

Graduated from the University of Geneva

A graduate degree in Medicine from Jena University

Emigrated to USSR in 1932

Returned to Hungary In 1958

Member of the Hungarian Academy of Sciences

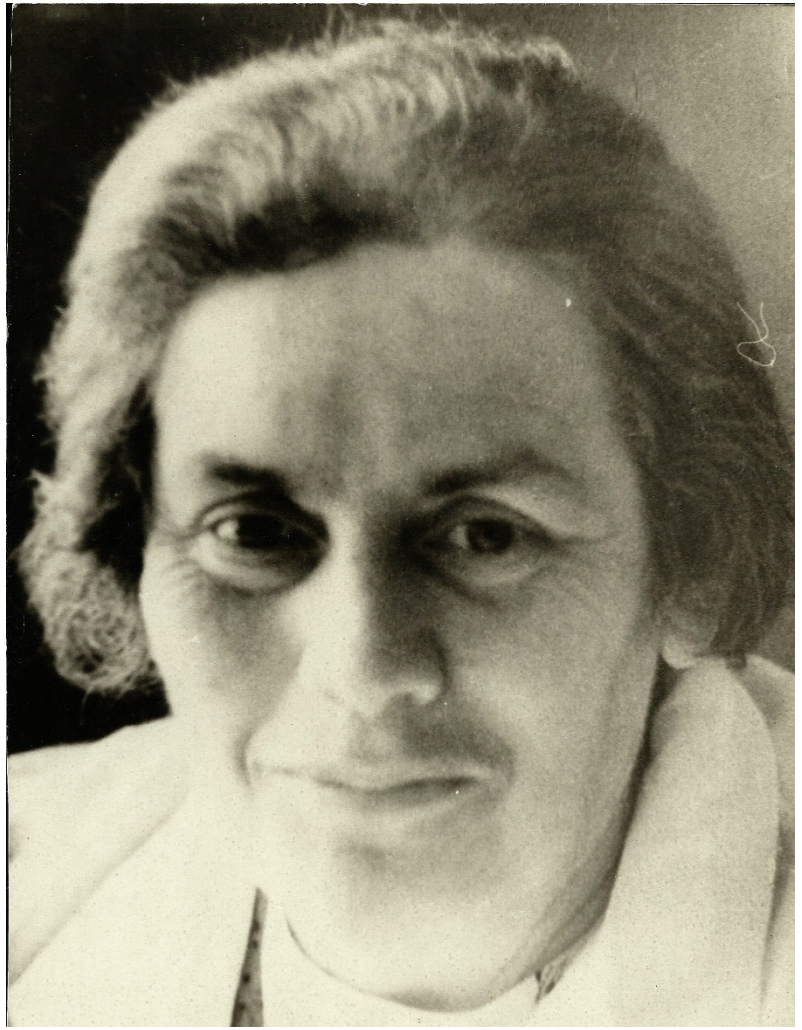
Mother:
Anna L. Bernstein
(1912-1977)

Born in Minsk, Belorussia (USSR)

Graduated from Sechenov First Moscow Medical Institute, Moscow, USSR

After WWII, in late 1940s, received PhD in Medicine from First Moscow Medical Institute

Doctor, neurologist



Growing up

Grew up with sister Olga in Moscow suburbs

From early childhood Boris enjoyed

- playing outdoors
- cross-country skiing
- playing chess
- collecting postal stamps

Boris never got bored outdoors

- started hiking at the age of 13

School/University

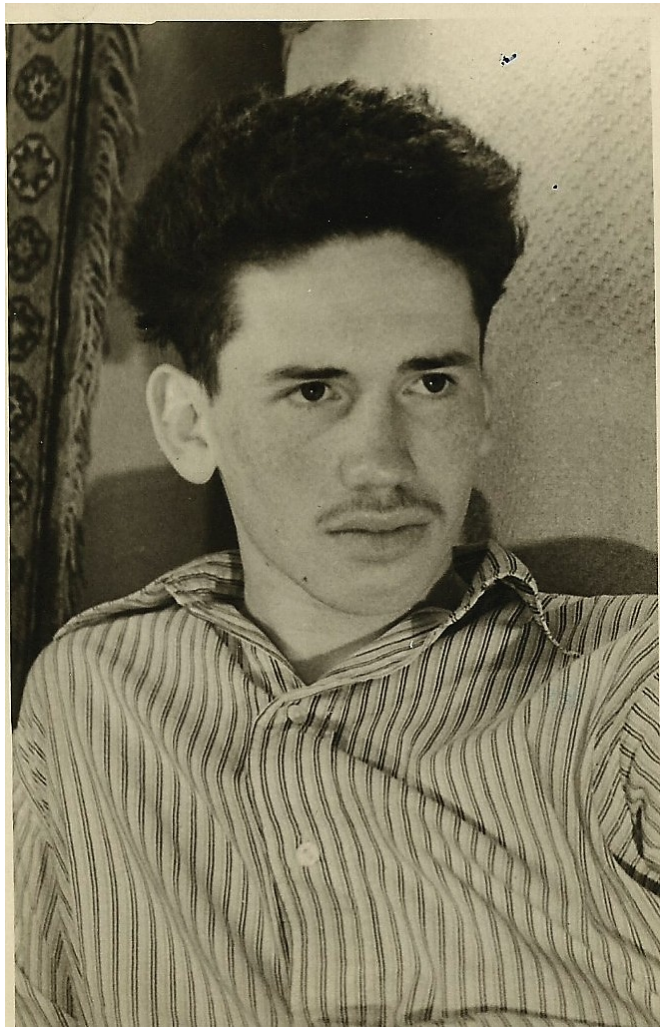
Boris finished high school with an almost perfect record - one B (writing)

Talented in mathematics

Winner of many youth math competitions

Applied to the Mathematics department ("Мех Мат») of the Moscow State University, Lomonosov’s University (MGU)

1/3 of their school’s class went to study math, Andrey Leman including



Career in Research

1963 - Graduated MGU with PhD thesis almost complete

Sent to work for 3 years at lamp factory

1966 - research position at the Institute for Theoretical and Experimental Physics (ITEP), the Stekhlov Institute

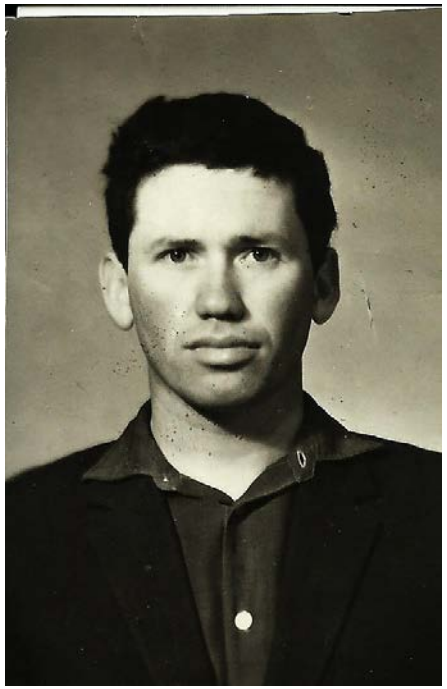
1968 - accused of being anti-Soviet, a charge related to A. Kronrod expulsion from ITEP

Boris fired from ITEP

Expelled from Komsomol

Engineer at the Institute for Industrial Controls

1969 - PhD degree from Leningrad's Department of Steklov Institute of Mathematics



‘Way to relax’

Boris began to hike alone often after best friend, classmate and hiking companion, Dima Antopolsky, tragically died in a boating accident

Was a very private person, has a small circle of close friends

Took long hiking trips in remote areas:

- enjoying nature and the local wildlife
- taking pictures
- eating simple food, local berries and mushrooms

Rarely had any accidents beyond minor cuts and bruises

Preferred to only have a knife or small hiking ax with him

Decision to Emigrate

By 1973 restricted career in science:

- Research papers were rarely published
- Can’t participate in conferences abroad
- Office desk was searched during his absence
- Can’t get permission to visit his father in Budapest, Hungary

Under pressure Boris decided to emigrate:

- Was fired from his job
- Left the University research group
- Lost his source of income – money left only for one meal a day
- Spent his days working in a library
- Spent time reading and teaching his four year old nephew how to defend himself from bullies

Leaving the USSR

Boris was preparing for his first trip abroad without possibility for a return

- renounced Soviet citizenship
- path to USA was through Vienna and Rome

Left Moscow March 30, 1975

Carried only two suitcases with:

- professional books
- his research papers
- favorite science fiction book
- his stamp collection
- backpack with hiking equipment

USA:
Princeton University

Entered USA in June 1975

Stayed in a Chicago hotel at first; His first pictures were views of streets with skyscrapers

September 1975: assistant professor for Armand Borel at the Institute for Advanced Study at Princeton, New Jersey

- they stayed in touch as friends and colleagues till Boris' disappearance

Penn State 1976-1985

1976 - Pennsylvania State University, PA

‘Taught students who sometimes did not want to be taught’ as Boris once said

Did a lot of research in his field of mathematics

Published many new research papers

Traveled in USA and internationally with lectures

Participated in conferences abroad

“About Education”

In the article published in the New York Times in 1981, "About Education” author, Fred M. Hechinger writes:

“In the last 10 years, more than 40 distinguished Soviet mathematicians have immigrated to the United States and are teaching at leading universities here. Most of them are victims of official anti-Semitism, which is reported to be particularly prevalent in the Soviet mathematics establishment.”

He continues:

“Soviet mathematicians who have moved into important positions here **include David Kazhdan** at Harvard; **Victor Kac** at the Massachusetts Institute of Technology; **Boris Moishezon and Gregory Chudnovsky** at Columbia; **Boris Weisfeiler and Leonid Vaserstein** at Pennsylvania State University; **Igor Dolgachev** at the University of Michigan; **Mikhael Gromov** at the State University of New York at Stony Brook; **Eugene Dynkin** at Cornell, and **Ilya Piatetskii-Shapiro** at Yale.”

Pennsylvania, 1976 -

Boris relished his new freedom he had to travel and explore the world:

- short hiking trips often
- travel to distant places twice a year
- in-between: working on math problems
- shared his travel stories and photos with friends and colleagues

Once said: "Animals are not dangerous, people are!"

He was the kind of person who felt the need to visit remote places and loved to tell stories about them.

He often travelled alone.

1981

Became US citizen

Met with family in Budapest, Hungary

Described his new life and his research work in the United States

- Boris worked a lot
- Did lots of research in his field of math
- Lived in a small rental apartment in State College
- Did not want to buy a house or an apartment, as he did not want to “worry about roof, pipes, grass, or snow” as he said, and wanted to be free of any property

Budapest, July 1981

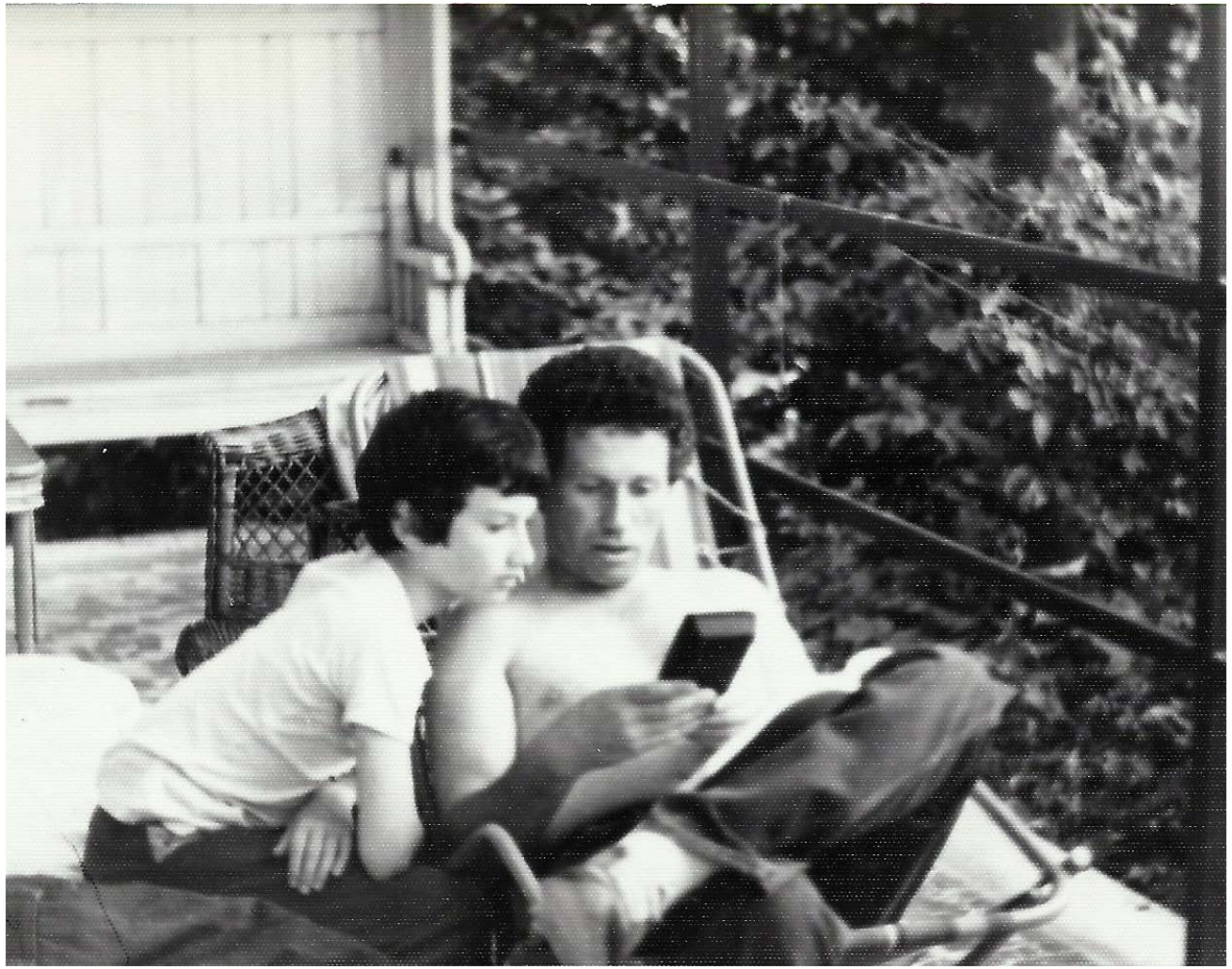
Brought me my first calculator and taught me first programming lesson

Boris was a good teacher

I finished MIT with degrees in Math and Physics

Career in software development

Now VP of Software Development at Konica Minolta Healthcare



Budapest, April 1984

Last time met in April 1984, in Budapest

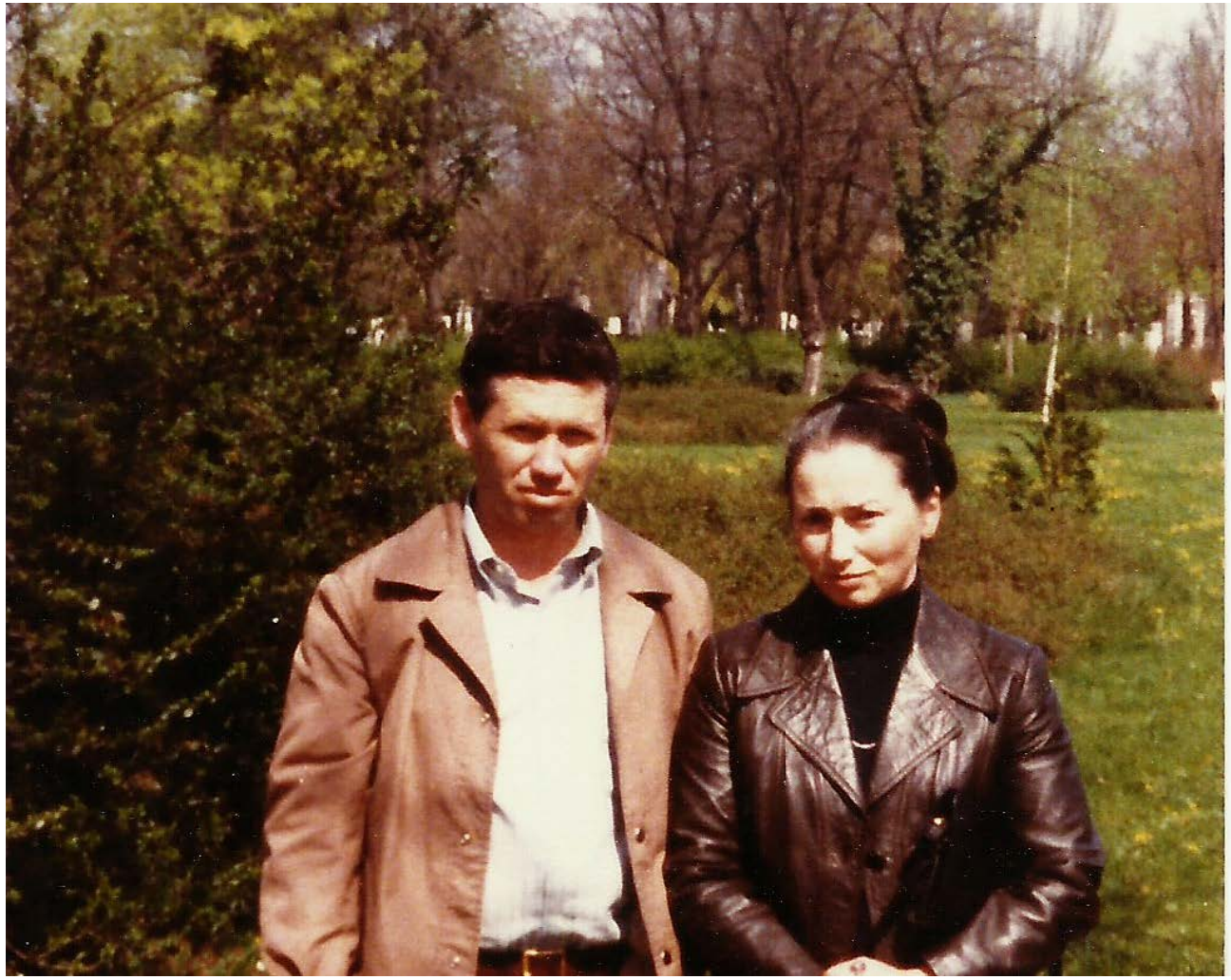
Family met at Gyula's funeral

Spent most of the time with Lev:

Family enjoyed their time together

Saw movie "E.T." which Boris liked

Celebrated Boris' 43rd birthday



December 1984

Went on another hiking trip - to Chile:

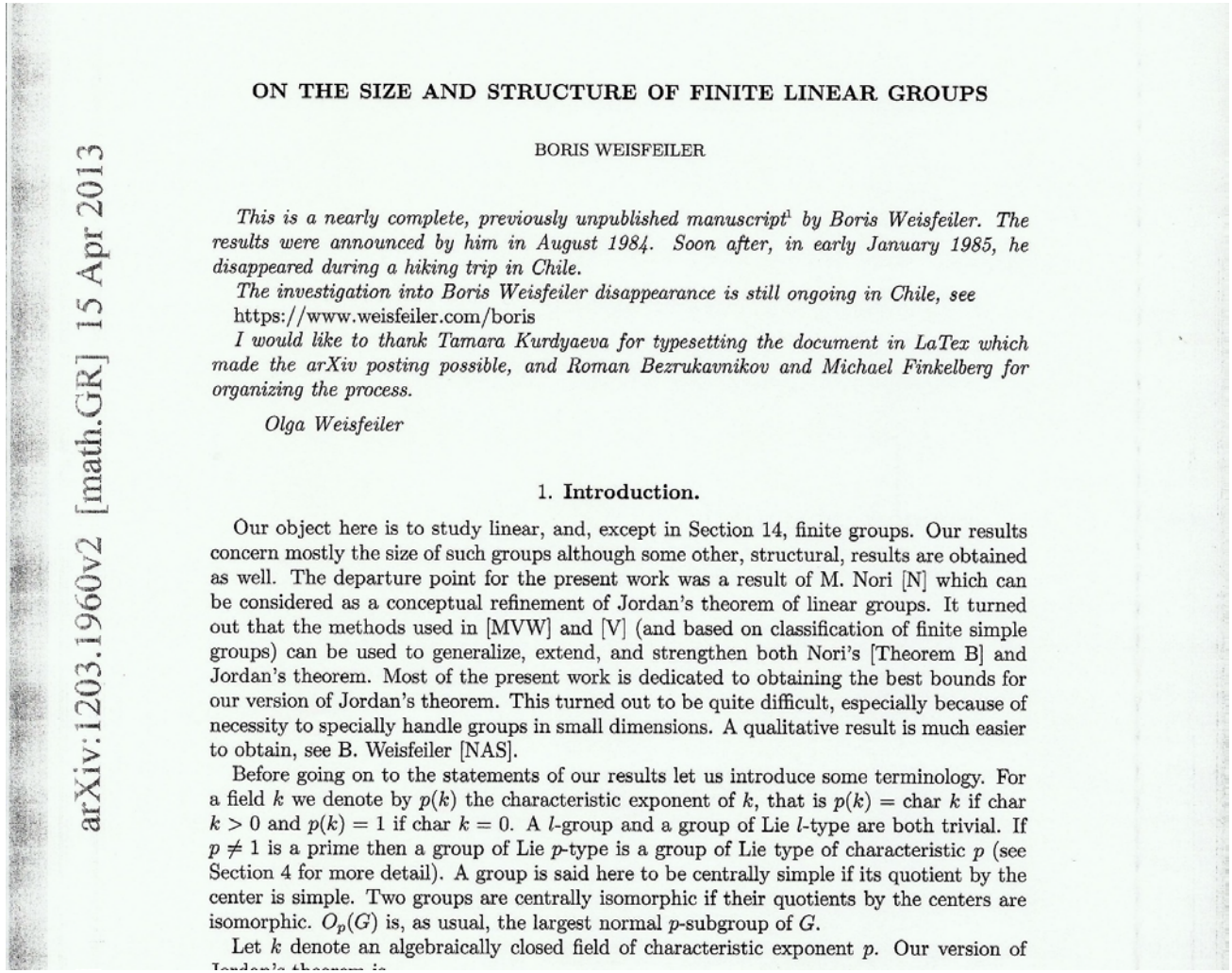
Boris said to David Kazhdan: "I want to wander, relax, and not see anyone."

Boris' December's letter came a month later: *"... I tried to finish my paper (already the new one), the old one I still did not finish. But again I did not have time to finish it...")*

It was his manuscript that he left behind: 'On the size and structure of finite linear groups'

Almost 30 years later, his sister Olga Weisfeiler was able to assemble and complete it and with help of other friends and mathematicians to post Boris' last work:

Posted in the ArXiv [arXiv:1203.1960v2]



ON THE SIZE AND STRUCTURE OF FINITE LINEAR GROUPS

BORIS WEISFEILER

This is a nearly complete, previously unpublished manuscript[1] by Boris Weisfeiler. The results were announced by him in August 1984. Soon after, in early January 1985, he disappeared during a hiking trip in Chile.

The investigation into Boris Weisfeiler disappearance is still ongoing in Chile, see https://www.weisfeiler.com/boris

I would like to thank Tamara Kurdyaeva for typesetting the document in LaTex which made the arXiv posting possible, and Roman Bezrukavnikov and Michael Finkelberg for organizing the process.

Olga Weisfeiler

1. Introduction.

Our object here is to study linear, and, except in Section 14, finite groups. Our results concern mostly the size of such groups although some other, structural, results are obtained as well. The departure point for the present work was a result of M. Nori [N] which can be considered as a conceptual refinement of Jordan's theorem of linear groups. It turned out that the methods used in [MVW] and [V] (and based on classification of finite simple groups) can be used to generalize, extend, and strengthen both Nori's [Theorem B] and Jordan's theorem. Most of the present work is dedicated to obtaining the best bounds for our version of Jordan's theorem. This turned out to be quite difficult, especially because of necessity to specially handle groups in small dimensions. A qualitative result is much easier to obtain, see B. Weisfeiler [NAS].

Before going on to the statements of our results let us introduce some terminology. For a field k we denote by $p(k)$ the characteristic exponent of k, that is $p(k) = \text{char } k$ if char $k > 0$ and $p(k) = 1$ if char $k = 0$. A l-group and a group of Lie l-type are both trivial. If $p \neq 1$ is a prime then a group of Lie p-type is a group of Lie type of characteristic p (see Section 4 for more detail). A group is said here to be centrally simple if its quotient by the center is simple. Two groups are centrally isomorphic if their quotients by the centers are isomorphic. $O_p(G)$ is, as usual, the largest normal p-subgroup of G.

Let k denote an algebraically closed field of characteristic exponent p. Our version of

Disappearance: 1985

Indictment: August 21, 2012 - eight retired police and military officers in connection with the kidnapping and disappearance of Boris Weisfeiler

- for "aggravated kidnapping" and "complicity" in the disappearance of a US citizen’s in January 3-5, 1985
- apart from taking away Boris' liberty, the agents have persisted in hiding the facts of the illegal detention and the whereabouts of Boris Weisfeiler

Four years later, in 2016, same judge closed the case, absolved all accused citing the statue of limitation

Appeal is still pending

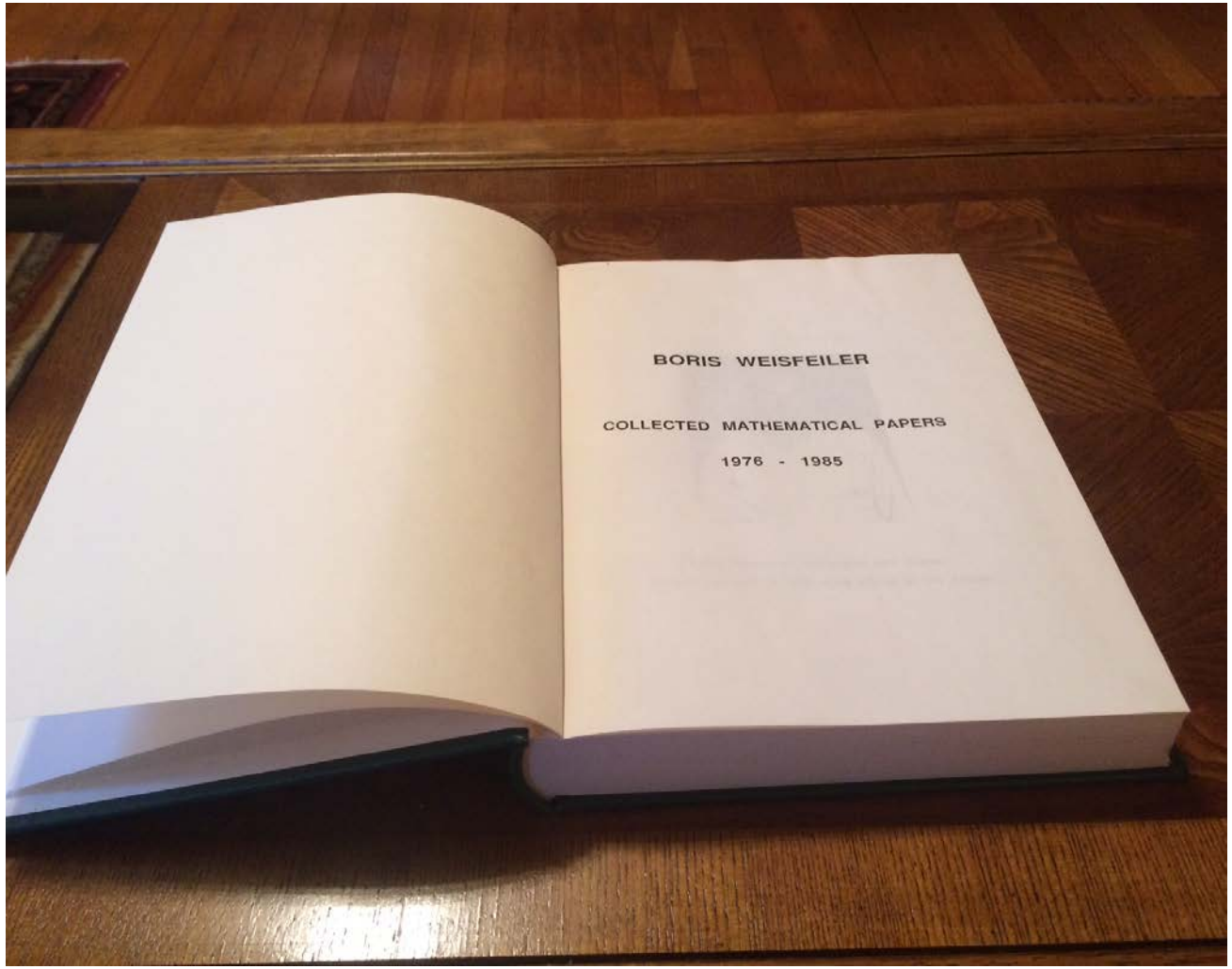
In memory:
Penn State Edition

After Boris disappeared, Penn State's math department published a book

"Boris Weisfeiler. Collected Mathematical Papers, 1976-1985“

Dedication under Boris’ picture:

"Boris Weisfeiler, colleague and friend. Lost in January of 1985 while hiking in the Andes"



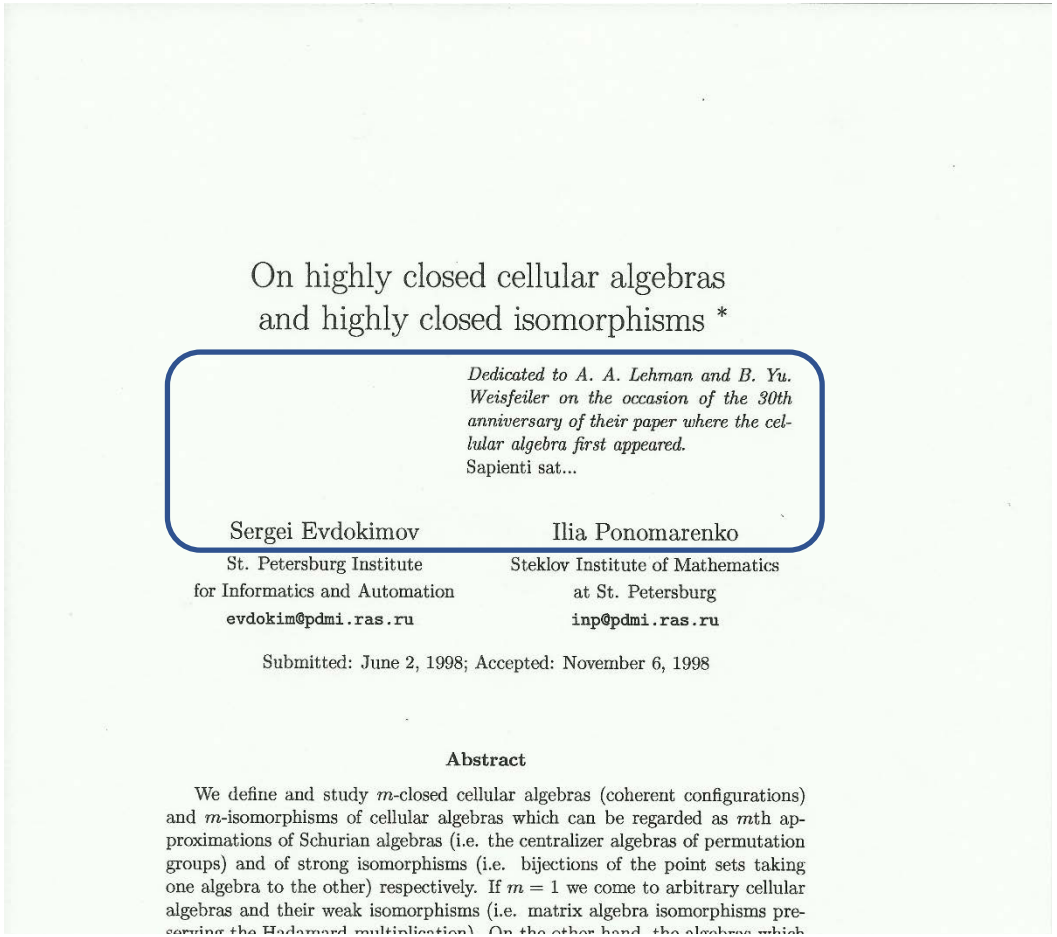
Dedications: from friends

- Victor Kac: "Boris was my best friend ever. He was a very generous and interesting man."
- David Kazhdan: "Boris was a very honest and dignified man who was very interested in people and culture."
- Don James: “Boris had a very generous and altruistic nature. I got a sense of a man with an intense inner life."
- Victor Guillemin: "He was incredibly generous about giving credit to others, and had a terrific sense of humor. He clearly liked living simply.”

Dedications: from friends

- Alex Lubotzky: “I have a great appreciation to Boris' mathematical work. I was much influenced by his work on strong approximation. It gave me (and others) a new perspective on linear groups and I have used Boris' result in several of my works. In fact I even feel that I have been given a credit which belongs to Boris: I was left to continue and to deduce from his work various corollaries that he would have done if he would be with us. The loss is huge for the whole mathematical community...” Dedicated 1985 work “In Honor of Boris Weisfeiler.”
- Predrag Cvitanovic: “I enjoyed talking to Boris when we were both in Princeton, so I dedicated my book based on work from that period to him and another friend whose life was extinguished by hate.”

Dedications: from colleagues



On highly closed cellular algebras
and highly closed isomorphisms *

Dedicated to A. A. Lehman and B. Yu. Weisfeiler on the occasion of the 30th anniversary of their paper where the cellular algebra first appeared.
Sapienti sat...

Sergei Evdokimov
St. Petersburg Institute
for Informatics and Automation
evdokim@pdmi.ras.ru

Ilia Ponomarenko
Steklov Institute of Mathematics
at St. Petersburg
inp@pdmi.ras.ru

Submitted: June 2, 1998; Accepted: November 6, 1998

Abstract

We define and study m-closed cellular algebras (coherent configurations) and m-isomorphisms of cellular algebras which can be regarded as mth approximations of Schurian algebras (i.e. the centralizer algebras of permutation groups) and of strong isomorphisms (i.e. bijections of the point sets taking one algebra to the other) respectively. If $m = 1$ we come to arbitrary cellular algebras and their weak isomorphisms (i.e. matrix algebra isomorphisms preserving the Hadamard multiplication). On the other hand, the algebras which

Dedications: from colleagues

linearly compact Lie superalgebras

Victor G. Kac*

Dedicated to the memory of my friend
Boris Weisfeiler
a remarkable man and mathematician.

Introduction

The present paper was motivated by the problem of classification of operator product expansions (OPE) in conformal field theory. This problem was solved in [DK] in the case when the chiral algebra is generated by finitely many bosonic fields such that in their OPE only linear combinations of these fields and their derivatives occur. An axiomatic description of such a system of fields is called a finite conformal algebra [K6]. The classification of finite conformal algebras uses in an essential way Cartan's classification of pseudogroups of transformations of a finite-dimensional manifold, which, in the modern language, is equivalent to the classification, up to formal equivalence, of Lie algebras of vector fields on a finite-dimensional manifold. The problem of classification of OPE when fermionic fields are allowed as well, or, equivalently, of finite conformal superalgebras, requires an extension of Cartan's theory to the case of supermanifolds. Below I explain the problem in more detail.

Elie Cartan published a solution to the problem (posed by Sophus Lie) of classification of simple infinite-dimensional Lie algebras of vector fields on a finite-dimensional manifold in 1909 [C]. This work had been virtually

*Department of Mathematics, M.I.T., Cambridge, MA 02139, <kac@math.mit.edu>
Supported in part by NSF grant DMS-9622870.

BULLETIN (New Series) OF THE
AMERICAN MATHEMATICAL SOCIETY
Volume 35, Number 2, April 1998, Pages 105–122
S 0273-0979(98)00749-6

MODULAR REPRESENTATIONS OF SIMPLE LIE ALGEBRAS

J. E. HUMPHREYS

To the memory of Boris Weisfeiler

ABSTRACT. In spite of many efforts over the past 50 years, the irreducible representations of the Lie algebra of a simple algebraic group over a field of prime characteristic are poorly understood. Recent work on quantum groups at a root of unity has provided new impetus for the subject. This article surveys what has been done and what remains to be done.

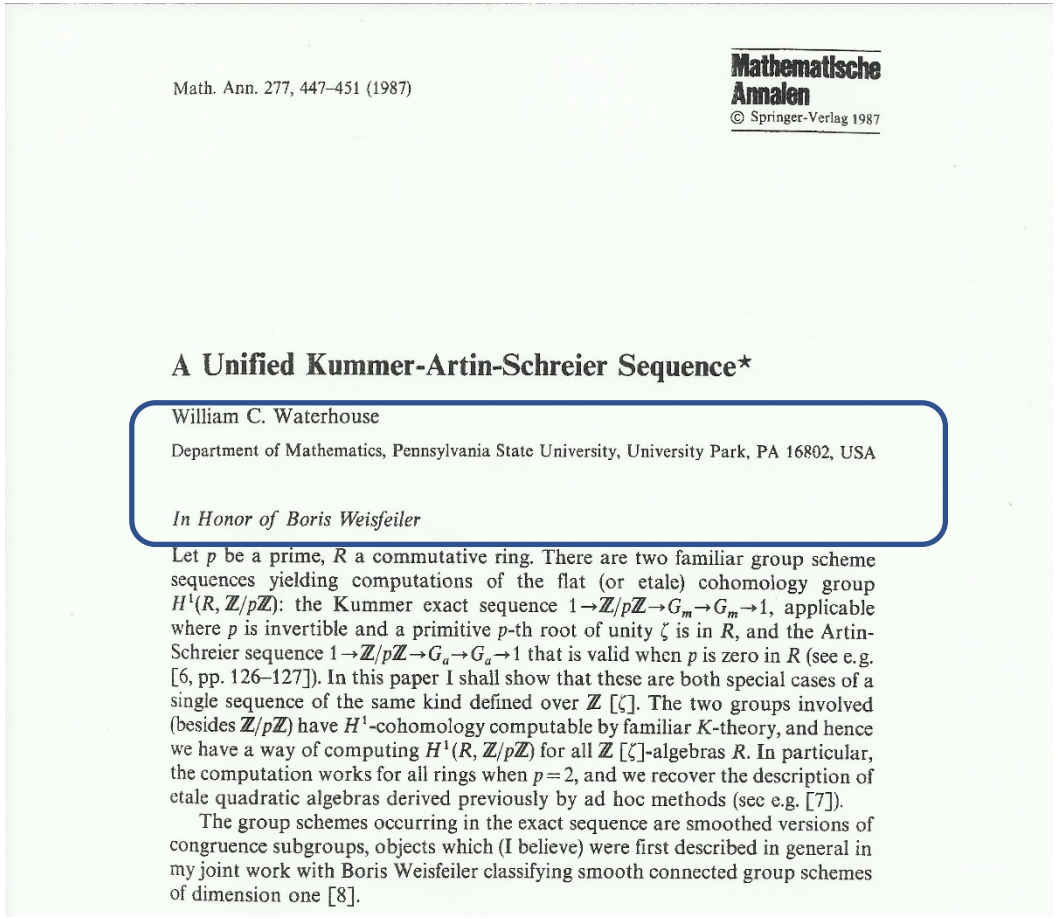
1. INTRODUCTION

Finite-dimensional representations of simple Lie algebras over $\mathbb{C}$ have been well-studied, from a variety of viewpoints: the algebraic "highest weight" theory of E. Cartan, the compact group viewpoint of H. Weyl, the geometric viewpoint of A. Borel, A. Weil, R. Bott, etc. Results for the Lie algebra are essentially interchangeable with results for the corresponding simply connected Lie group or a compact real form.

The groups and Lie algebras over $\mathbb{C}$ have analogues over fields of prime characteristic, such as special linear groups $\mathrm{SL}(n, K)$ and Lie algebras $\mathfrak{sl}(n, K)$. Highest weight representations of the groups also occur naturally in this setting, as shown by C. Chevalley in the late 1950's. Apart from their intrinsic interest, these representations play a key role in the representation theory of finite simple groups of Lie type. In the last decade, new motivation for the "modular" theory has arisen from the study of quantum groups at a root of unity.

Our goal is to give a concise overview of what is (and is not) known about the irreducible representations of the Lie algebra $\mathfrak{g}$ of a simple algebraic group G over an algebraically closed field K of characteristic $p > 0$. Besides the "restricted" representations obtained by differentiating representations of G, there are many others with no obvious connection to group theory. These have been studied sporadically for over half a century, starting with fundamental work of H. Zassenhaus from 1939

Dedications: from colleagues



Math. Ann. 277, 447–451 (1987)

Mathematische Annalen

A Unified Kummer-Artin-Schreier Sequence*

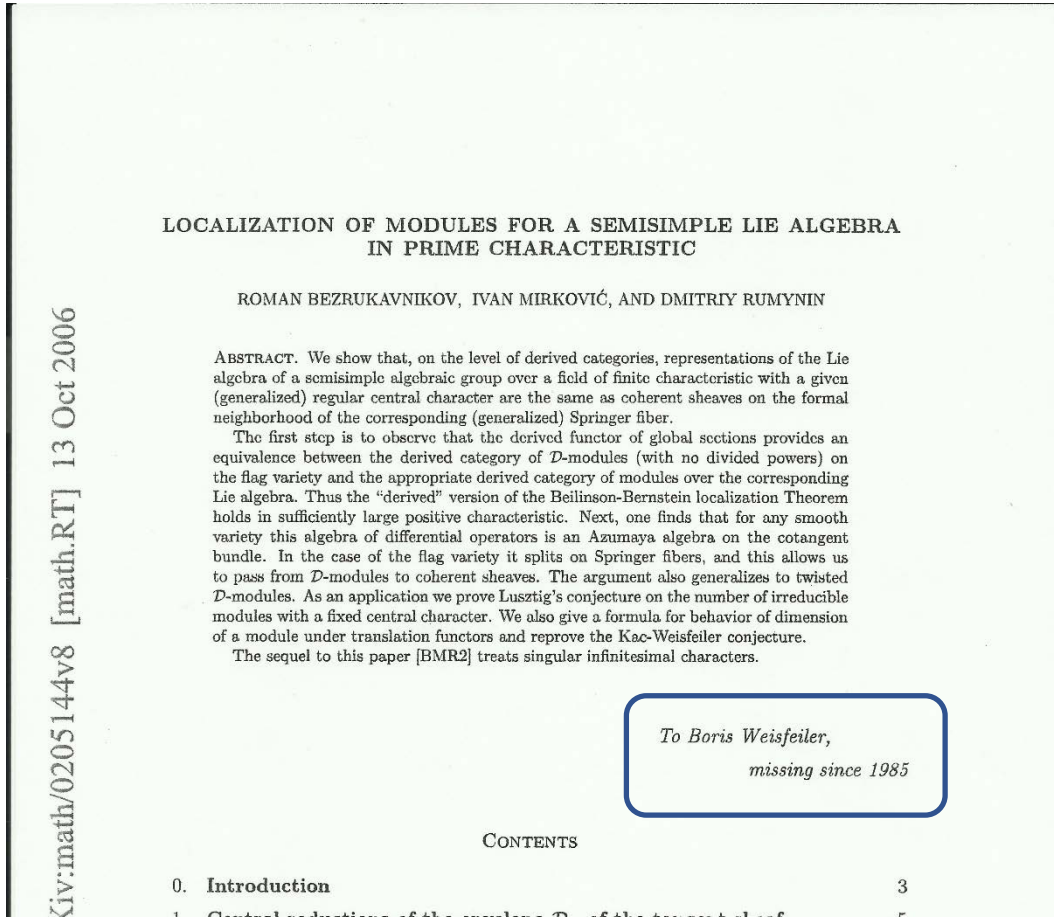
William C. Waterhouse

Department of Mathematics, Pennsylvania State University, University Park, PA 16802, USA

In Honor of Boris Weisfeiler

Let p be a prime, R a commutative ring. There are two familiar group scheme sequences yielding computations of the flat (or etale) cohomology group $H^1(R, \mathbb{Z}/p\mathbb{Z})$: the Kummer exact sequence $1 \to \mathbb{Z}/p\mathbb{Z} \to G_m \to G_m \to 1$, applicable where p is invertible and a primitive p-th root of unity ζ is in R, and the Artin-Schreier sequence $1 \to \mathbb{Z}/p\mathbb{Z} \to G_a \to G_a \to 1$ that is valid when p is zero in R (see e.g. [6, pp. 126–127]). In this paper I shall show that these are both special cases of a single sequence of the same kind defined over $\mathbb{Z}[\zeta]$. The two groups involved (besides $\mathbb{Z}/p\mathbb{Z}$) have H^1-cohomology computable by familiar K-theory, and hence we have a way of computing $H^1(R, \mathbb{Z}/p\mathbb{Z})$ for all $\mathbb{Z}[\zeta]$-algebras R. In particular, the computation works for all rings when $p = 2$, and we recover the description of etale quadratic algebras derived previously by ad hoc methods (see e.g. [7]).

The group schemes occurring in the exact sequence are smoothed versions of congruence subgroups, objects which (I believe) were first described in general in my joint work with Boris Weisfeiler classifying smooth connected group schemes of dimension one [8].



LOCALIZATION OF MODULES FOR A SEMISIMPLE LIE ALGEBRA IN PRIME CHARACTERISTIC

ROMAN BEZRUKAVNIKOV, IVAN MIRKOVIĆ, AND DMITRIY RUMYNIN

ABSTRACT. We show that, on the level of derived categories, representations of the Lie algebra of a semisimple algebraic group over a field of finite characteristic with a given (generalized) regular central character are the same as coherent sheaves on the formal neighborhood of the corresponding (generalized) Springer fiber.

The first step is to observe that the derived functor of global sections provides an equivalence between the derived category of $\mathcal{D}$-modules (with no divided powers) on the flag variety and the appropriate derived category of modules over the corresponding Lie algebra. Thus the "derived" version of the Beilinson-Bernstein localization Theorem holds in sufficiently large positive characteristic. Next, one finds that for any smooth variety this algebra of differential operators is an Azumaya algebra on the cotangent bundle. In the case of the flag variety it splits on Springer fibers, and this allows us to pass from $\mathcal{D}$-modules to coherent sheaves. The argument also generalizes to twisted $\mathcal{D}$-modules. As an application we prove Lusztig's conjecture on the number of irreducible modules with a fixed central character. We also give a formula for behavior of dimension of a module under translation functors and reprove the Kac-Weisfeiler conjecture.

The sequel to this paper [BMR2] treats singular infinitesimal characters.

To Boris Weisfeiler,
missing since 1985

CONTENTS

Our website

To learn more, please visit:

http://boris.weisfeiler.com

List of publications:

http://boris.weisfeiler.com/papers/papers.html

Email to: olga@weisfeiler.com