Newsletter

BELGIAN MATHEMATICAL SOCIETY

140, November 15, 2022

Comité National de Mathématique CNM

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NCW Nationaal Comité voor Wiskunde

Newsletter of the Belgian Mathematical Society and the National Committee for Mathematics

Belgian Mathematical Society ASBL/VZW
ULB Campus Plaine, C.P. 218/01,
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Contents

The next edition of this newsletter will appear on January 15th, hence, till January 9th all content can be sent to wendy.goemans@kuleuven.be. Any information that you qualify as interesting to be spread among the Belgian Maths community is very much welcomed! Examples of such information are: PhD defenses, seminars, conferences, workshops, meetings, interaction with other sciences or business companies, popular lectures, school initiatives, math exhibitions, job opportunities, . . .

Foreword

Dear BMS members,

Welcome to the last Newsletter of 2022. We hope you are all thriving despite the busy schedules, and that you still manage to find some time to enjoy some maths!

Among the many activities available, we wish to remind you that the BMS is helping to organize the "Algebras, Geometries, and Groups" conference in memory of Jacques Tits which will be held at the Academy (see http://dwispc8.vub.ac.be/nieuwBMS/index.php?id=agg). There is still the possibility to register if you so wish. We will also send out an invitation to the GA which will take place early 2023; more information will follow in due course.

Please don't hesitate to contact us if you have questions or queries about maths or organizing math events; we can't promise to answer but we can promise to try!

Have a nice end of year,

Céline, Joost, Wendy and Yvik

1 News from the BMS & NCM

1.1 Algebras, Geometries, and Groups

A conference in memory of Jacques Tits (1930 - 2021)

When: Tuesday 20th December and Wednesday 21th December 2022
Where: Académie Royale de Belgique (Rooms Albert II and Salle de marbre) Rue Ducale 1, Bruxelles

Registration: Attendance is open to everyone, but registration is compulsory, see below for registration (no google address is required; if you have any trouble with the registration form then just send an email to yvik(dot)swan(at)ulb(dot)be).
Registration fee: If you register (and pay the registration fee) before October 15th: attendance is free for PhD students and 30 EUR per person per day for non-PhD students. From October 16 onwards, attendance is 30 EUR per day for PhD students and 50 EUR per person per day for non-PhD students. After registration, you will receive an email confirmation along with information about the method of payment. Registration includes lunches and coffee breaks.

Confirmed Speakers:

- Jean-Pierre BOURGUIGNON (IHES): Reminiscences about Science and Jacques Tits
- Michel BRION (Grenoble): Primitive homogeneous varieties
- Michel BROUE (Paris): About Complex Reflection Groups
- Bernhard MÜHLHERR (Gießen): Buildings and Root Gradings
- Guy ROUSSEAU (Nancy): Twin measures for Kac-Moody groups over Laurent polynomial rings
- Katrin TENT (Münster): Sharply 2-transitive groups and the Burnside problem
- Donna TESTERMAN (Lausanne): Overgroups of regular unipotent elements, finite and algebraic
- Jean-Pierre TIGNOL (Louvain-La-Neuve): Quadratic forms in characteristic 2 and trialitarian triples

- Richard WEISS (Tufts): Tits Polygons

Sadly, Anne PARREAU's talk had to be cancelled.

Organisers: Pierre-Emmanuel CAPRACE (UCLouvain), Ann DOOMS (VUB), Fabien DURAND (UPJV, SMF), Simone GUTT (ULB), Alain VALETTE (UNeuchatel, SMS), Hendrik VAN MALDEGHEM (UGent), Joost VERCRUYSSE (ULB, BMS).

With the administrative support of the Belgian Mathematical Society via Céline ESSER (ULiège) and Yvik SWAN (ULB).

Sponsors: fwo, frns, fwb, ulb, ugent, Académie royale de Belgique.

For the most recent information and registration, see http://dwispc8.vub.ac.be/nieuwBMS/index.php?id=agg

1.2 Bulletin of the Belgian Mathematical Society - Simon Stevin

Starting from Volume 28 the Bulletin of the Belgian Mathematical Society - Simon Stevin only appears online and is not printed any more. As a member of the BMS you have electronic access to all electronically available issues of the bulletin, free of charge. If you have any trouble logging in or accessing the journal, please contact customer_support@projecteuclid.org.

Content Volume 28 (5) September 2022

- Classification of finite-dimensional Hopf algebras over dual Radford algebras **Rongchuan Xiong, Naihong Hu** DOI: 10.36045/j.bbms.210612
- Jet schemes of quasi-homogeneous hypersurfaces and motivic monodromy conjecture for isolated quasi-homogeneous hypersurface singularities **Julien Sebag** DOI: 10.36045/j.bbms.210506
- Distinguished vector-valued continuous function spaces and injective tensor products **J. C. Ferrando, J. Kakol** DOI: 10.36045/j.bbms.210812
- Mapping properties of the fractional integral operators on Herz-Hardy spaces with variable exponents **Kwok-Pun Ho** DOI: 10.36045/j.bbms.211026
- A new approach to the three bisectors problem **Dan Ştefan Marinescu, Eugen Păltănea** DOI: 10.36045/j.bbms.211105
- Galois correspondence for group-type partial actions of groupoids **Dirceu Bagio, Alveri Sant'Ana, Thaísa Tamusiunas** DOI: 10.36045/j.bbms.210807
- Cofiniteness of generalized local cohomology modules with respect to the class of modules in dimension less than a fixed integer **Alireza Vahidi, Saeid Morsali** DOI: 10.36045/j.bbms.201230

For the table of contents of previous issues, see https://projecteuclid.org/all/euclid.bbms.

2 (Online) Meetings, Conferences, Lectures, ...

2.1 January 2023

Workshop - Lie Groups, Singular Spaces, and Higher Structures

January 9-13 2023, The Fields Institute, Toronto, Ontario, Canada

The purpose of this conference is to create a discussion between experts that work on a number of such approaches to singular spaces as well as on the broader themes that lead to these structures: Hamiltonian group actions, completely integrable systems, and geometric quantization.

All information is here: http://www.fields.utoronto.ca/activities/22-23/lie-groups

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Connections Workshop: Algebraic Cycles, L-Values, and Euler Systems

January 19-20 2023, Berkeley, California, United States

The Connections Workshop features presentations by both leading researchers and promising newcomers whose research has contact with the interrelated topics of algebraic cycles, L-values, and Euler systems. The goal is to present a variety of diverse results, so as to forge new connections, foster collaborative projects, and establish mentoring relationships. While emphasis will be placed on the work of women mathematicians, the workshop is open to all researchers.

All information is here: https://www.msri.org/workshops/978

2.2 February 2023

Young Geometric Group Theory XI

February 13-17 2023, Münster, Germany

The workshop focuses on four main speakers, each giving a 4-hour mini-course on a topic in Geometric Group Theory. Their lectures present a panoramic overview over some important developments in their field with the goal to enable the participants to actively participate in the new directions of research emerging from these developments.

All information is here: https://www.uni-muenster.de/GGT/YGGT/

15th International group theory conference of Iran

February 20-21 2023, Tehran, Iran

Abstract: Group theory plays an important role in different branches of Mathematics, for example, Geometry, Number Theory, and Analysis. Also, group theory is one of the most powerful mathematical tools used in applied mathematics, cryptography, coding theory, steganography, quantum chemistry, spectroscopy, robotics, computer vision, and quantum computation. It allows the user to predict, interpret, rationalize, and often simplify complex theory and data. The development in each field of group theory is getting faster and deeper. This fact makes all researchers reach for a better understanding of the current works and developments, in all fields of group theory and its applications. The aim of this conference is to exchange research ideas amongst the group theorists. In addition, specialists in the subject of group theory can present their latest research works and encourage interested students to progress and widen their knowledge in group theory.

All information is here: https://igtc15.aut.ac.ir/

2.3 March 2023

AIM Workshop: Discrete and combinatorial homotopy theory
March 13-17 2023, San Jose, California, United States

This workshop, sponsored by AIM and the NSF, will be devoted to homotopy theories developed for the study of discrete and combinatorial objects. Many different models of discrete homotopy have emerged in the past 20-30 years, developed largely in isolation from one another. In this workshop, we will study different perspectives on discrete homotopy and explore their connections and differences. Among our goals is to identify important applications, particularly to combinatorics, metric geometry, and geometric group theory. We will also investigate how ideas from abstract homotopy theory (model categories, simplicial and cubical homotopy, infinity categories, etc.) may be used to extend and consolidate the theories.

The main topics of this workshop are: A-theory of graphs and simplicial complexes; Homotopy of digraphs; Digital homotopy ; Discrete homotopy of metric spaces; Homotopy theory in topological categories; Applications of abstract homotopy theory to discrete homotopy; Applications of discrete homotopy to combinatorics, metric geometry, geometric group theory, and other areas.

All information is here: https://aimath.org/workshops/upcoming/combhomotop/

17th International Young Researchers Workshop on Geometry, Mechanics and Control
March 29-31, 2023 (KULeuven)

This workshop is a yearly international event to promote young researchers in the field of differential geometry and its relations to mechanics and control theory. The workshop features three mini-courses in key topics in the field, given this year by Chiara Esposito (Universitá degli Studi di Salerno), Azahara de la Torre Pedraza (Sapienza Universitá di Roma) and Maryam Kamgarpour (École Polytechnique Fédérale de Lausanne). Besides, there are selected talks proposed by the participants and a poster session. This event is targeted to all researchers in the field, with an emphasis on young participants (doctoral students and postdocs). The registration deadline is January 15th, 2023.

https://wis.kuleuven.be/events/young-researchers-workshop2023/young-researchers-workshop2023

2.4 April 2023

Workshop - Density Problems in Arithmetics

April 3-7 2023, Luminy, France

ln this workshop, we will consider variants of Artin's primitive root conjecture leading to the study of the Galois groups of various radical extensions. Beyond the case of the multiplicative group studied by Lenstra and others, there are now also interesting results for elliptic radicals, and for division points in more general abelian varieties. ln this context, the elliptic analogue of Artin's conjecture is the Lang-Trotter conjecture, which is still open after more than 40 years.

All information is here: https://www.chairejeanmorlet.com/2678.html

Mini-School - Huge groups

April 3-6 2023, Montréal, Canada

This mini-school focuses on "huge" groups, such as the Cremona group and its subgroups, the homeomorphism group of a surface, the mapping class group of an infinite-type surface, a general Artin group. They can be studied through non-proper actions on nonpositively or negatively curved combinatorial spaces.

All information is here: https://www.crmath.ca/en/activities/#/type/activity/id/3854

EvoCOP - 23rd European Conference on Evolutionary Computation in Combinatorial Optimisation

April 12-14 2023, Brno, Czech Republic

The 23rd European Conference on Evolutionary Computation in Combinatorial Optimisation is a multidisciplinary conference that brings together researchers working on applications and theory of evolutionary computation methods and other metaheuristics for solving difficult combinatorial optimisation problems appearing in various industrial, economic, and scientific domains.

All information is here: https://www.evostar.org/2023/evocop/

Representations of Finite Groups

April 16-22 2023, Oberwolfach, Germany

The idea of the Arbeitsgemeinschaft is to learn by giving a lecture on some new results which have been found recently by other researchers working in some specific topic. Organizers and topics for the next Arbeitsgemeinschaft are proposed during the current Arbeitsgemeinschaft. Participation is by application to the organizers.

All information is here: https://www.mfo.de/occasion/2316/www_view

2.5 May 2023

Workshop - Lefschetz Properties in Algebra, Geometry, Topology and Combinatorics

May 15-19 2023, The Fields Institute, Toronto, Ontario, Canada

The study of Lefschetz properties for Artinian algebras was motivated by the Lefschetz theory for projective manifolds, begun by S. Lefschetz, and well established by the late 1950's. Many of the important Artinian graded algebras appear as cohomology rings of an algebraic variety or manifold, though recent important developments have demonstrated important cases of the Lefschetz properties beyond

such geometric settings (such as Coxeter groups or matroids). This renews interest in understanding the Lefschetz property, and Artinian algebras that admit them, systematically.

All information is here: http://www.fields.utoronto.ca/activities/22-23/Lefschetz

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BIRS Workshop - Joint Spectra and related Topics in Complex Dynamics and Representation Theory

May 21-26 2023, Banff, Alberta, Canada

Mathematics has a wide range of different disciplines, from algebra to geometry and from analysis to topology, etc. Some discoveries, however, are able to link several disciplines together and open a field of interplay. Two of such recent discoveries are self-similar group representations and projective spectrum of linear operators. The goal of this workshop is bring together scholars in spectral theory, representation theory, complex dynamics and other related fields to exchange and examine some recent discoveries on self-similarity and projective spectrum.

All information is here: https://www.birs.ca/events/2023/5-day-workshops/23w5033

2.6 June 2023

Foundations of Computational Mathematics
June 12-21 2023, Paris - France

FoCM conferences are usually organized as follows: mornings are devoted to plenary talks and afternoons to the workshops, which are run in parallel. The conference is divided in three periods of three days, and each workshop is held during one of these periods. The spirit of FoCM is that participants are encouraged to come to the whole duration of the conference, and attend talks in different workshops. Poster sessions are also organized by each workshop.

All information is here: https://focm2023.org/

2.7 August 2023

Finite Dimensional Integrable Systems (FDIS 2023)
August 7-11, 2023
UAntwerpen

The 7th International Conference on *Finite Dimensional Integrable Systems in Geometry and Mathematical Physics (FDIS 2023)* will take place during August 7-11, 2023 at the University of Antwerp/Belgium.

The previous editions took place in Jena/Germany (2011), at CIRM (Luminy)/France (2013), in Bedlewo/Poland (2015), in Barcelona/Spain (2017), in Shanghai/China (2019), and in Tel Aviv/Israel (2022).

More information will be announced soon via the conference webpage
https://www.uantwerpen.be/nl/personeel/sonja-hohloch/private-webpage/conference-workshop/fdis2023/

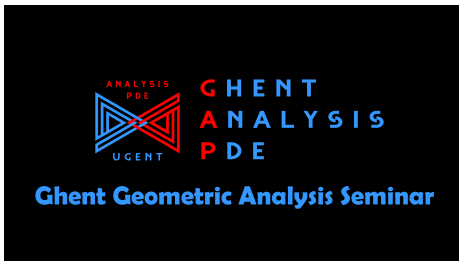
2.8 Seminars and colloquia

Analysis & Geometry Seminar
UAntwerpen
(usually Wednesdays 16-17h during term)

This is the weekly research seminar of the analysis & geometry-interested people in Antwerp. During the semester, we have once per week a research talk in analysis and/or geometry and/or related topics. The list of speakers comprises researchers from Antwerp as well as other universities. Details (schedule, speakers, titles, abstracts, seminar room/ online/ hybrid etc.) can be found on the seminar webpage https://www.uantwerpen.be/nl/personeel/sonja-hohloch/private-webpage/seminars/analysis-geometry/

To be added/deleted from the mailing list, please send an email to:
sonja dot hohloch AT uantwerpen dot be

Ghent Geometric Analysis Seminar



The Ghent Geometric Analysis seminar is dedicated to studying the modern techniques of elliptic and subelliptic partial differential equations (PDEs) that are used to establish new results in differential geometry and differential topology. We are planning to invite several of the leaders in the fields of microlocal analysis, geometric analysis, and harmonic analysis abroad.

In view of the recent activities and investigations undertaken by the members of the Ghent Analysis and PDE center and the works in the interplay of geometric analysis and harmonic analysis of our group, our seminar also will be a scenario for presenting the recent developments in the field and their applications to other branches in mathematics. Visit the website of our new Ghent Geometric Analysis Seminar at https://analysis-pde.org/seminars/ghent-on-geometric-analysis/.

Scheduled talks are (to be updated):

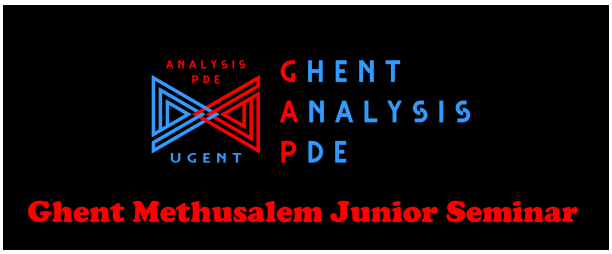
- 14 November 2022, Gerd Grubb, University of Copenhagen, Denmark.

Organisers:

- Duvan Cardona Sanchez (Duvan.CardonaSanchez@UGent.be)
- David Santiago Gómez Cóbos (davidsantiago.gomezcobos@ugent.be).

Visit also the website of the seminar to be informed of the scheduled intensive mini-courses about geometric analysis.

Ghent Methusalem Junior Seminar



The Ghent Methusalem Junior Seminar is run by PhD students and postdocs at the **Ghent Analysis & PDE Center** (https://analysis-pde.org).

It provides an ideal opportunity for young researchers in mathematics to share their ideas and to learn about new trends in a wide range of fields. Targeting a mainly (though not exclusively) young audience has meant for the organizers to ensure a relaxed atmosphere and to encourage the audience to engage in stimulating discussions with the speakers, ideally leading to new collaborations.

The seminar currently takes place every Tuesday at 4.30 PM (CET) on ZOOM. For more information about our activity and about past and future talks, please visit the dedicated webpage: https://analysis-pde.org/ghent-methusalem-junior-seminar/.

If you would like to give a talk or to invite someone to give a talk, please contact:

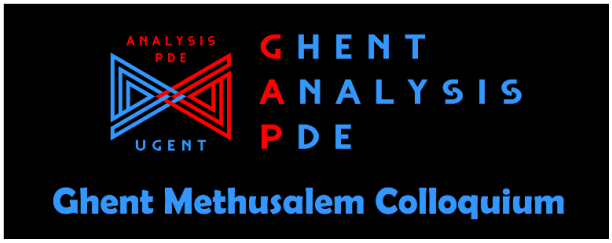
- Duvan Cardona Sanchez, Ghent University, (Duvan.CardonaSanchez@UGent.be)
- Serena Federico, Università di Bologna, (serena.federico2@unibo.it)
- Vishvesh Kumar, Ghent University, (Vishvesh.Kumar@UGent.be)
- David Rottensteiner, Ghent University, (David.Rottensteiner@UGent.be)
- Bolys Sabitbek, Queen Mary University of London, (b.sabitbek@qmul.ac.uk)

Scheduled talks are:

- 9 November 2022, Zongyuan Li (Rutgers University, USA).
- 16 November 2022, Katrina Morgan (Northwestern University, USA).
- 23 November 2022, Nicolas Camps (Université Paris-Sud, France).
- 30 November 2022, Arick Shao (Queen Mary University of London, UK).
- 7 December 2022, Grigalius Taujanskas (University of Cambridge, UK).
- 14 December 2022, Emiel Lorist (Delft University of Technology, Netherlands).

Ghent Methusalem Colloquium

The Ghent Methusalem Colloquium is intended for a broad audience of PhD students, postdocs and professors at the Ghent Analysis & PDE Center and beyond. The series includes colloquia from visiting



and invited guests. Visit the website of our new Ghent Methusalem Colloquium at https://analysis-pde.org/ghent-methusalem-colloquium/.

Visit the webpage of the colloquium to have a look of the scheduled talks by:

- Prof. Andreas Seeger, University of Wisconsin-Madison, US.
- Prof. Roland Duduchava, University of Georgia Tbilisi, Georgia.
- Prof. Eugene Shargorodsky, King's College London, UK.
- Prof. Durvudkhan Suragan, Navarbayev University, Kazakhstan.
- Prof. Julio Delgado, Universidad Del Valle, Cali-Colombia.
- Prof. Johannes Sjostrand, The Institut de Mathématiques de Bourgogne, France
- Prof. Victor Nistor, The Institut Élie Cartan de Lorraine, France.
- Prof. Gerd Grubb, University of Copenhagen, Denmark.

The Ghent Methusalem Junior Seminar and the Ghent Methusalem Colloquium are supported by FWO Odysseus 1 Project: Analysis and Partial Differential Equations, and by the Ghent University Methusalem Programme "Analysis & PDE".

International Conference: Multidisciplinary Aspects in Mathematics and its Applications (ICMAM Latin America 2022)

Jointly organised by Universidad de Pamplona (Colombia), Universidad de Sao Paulo (Brazil), Freie Universität Berlin (Germany), and Ghent Analysis & PDE Centre, UGent, Belgium.

Confirmed Plenary talks

- **Terence Tao**, UCLA, USA.
- **Michael Ruzhansky**, Ghent University and Queen Mary University of London, Belgium and UK.
- **Tatiana Toro,** Department of Mathematics, University of Washington, USA. Vice President International Mathematical Union.
- **Simon Donaldson,** Imperial College London, UK.

- **Carlos Kenig,** University of Chicago. President International Mathematical Union.
- **David Dos Santos Ferreira,** Institut Élie Cartan, Université de Lorraine, France.
- **Enrique Zuazua**, Deusto University, Friedrich-Alexander-Universität Erlangen-Nürnberg, Universidad Autónoma de Madrid, Germany and Spain.
- **Harald Helfgott**, Alexander von Humboldt Professor, University of Göttingen.

Description

The Department of Mathematics at the Universidad del Valle, Cali-Colombia, is delighted to invite you to the International conference: Multidisciplinary Aspects in Mathematics and its applications (ICMAM) 2022, Latin America. The honoree of this year at the conference is the Colombian Mathematician José Raúl Quintero, 2011 National Mathematics Award, Colombian Mathematical Society (Universidad del Valle, Cali-Colombia).

The International conference: Multidisciplinary Aspects in Mathematics and its applications (ICMAM) seeks to contribute to the development of mathematical research in Latin America and the Caribbean, stimulate its visibility and promote exchange between mathematicians of the region and from other parts of the world.

Official website https://sites.google.com/view/matematicasunivalleicmam2022/home

Organisers

- Chair/President ICMAM 2022: Prof. Dr. Brian Grajales Triana, (Universidad de Pamplona, Colombia).
- Co-chair: Karina Navarro Gonzalez (Universidad de São Paulo, Brazil).
- Milton Manuel Aguirre (Universidad São Paulo, Brazil).
- Jessica Gonzalez Hurtado (Freie Universität Berlin, Germany).

- Julio Delgado, (Universidad del Valle Cali, Colombia).
- Marlio Paredes, (Director of the Graduate Program in Mathematical Science at Universidad del Valle, Cali-Colombia).
- Hector Jairo Martínez, (Chair of the Department of Mathematics at Universidad del Valle, Cali-Colombia).
- President of the Scientific Committee: Duvan Cardona Sanchez (Universiteit Gent, Belgium).

Scientific Board

- Duvan Cardona Sanchez, President of the Scientific Board, Ghent University, Belgium.
- Emanuel Carneiro, ICTP, The Abdus Salam International Centre for Theoretical Physics.
- Alicia Dickenstein, Former Vice-President, International Mathematical Union, University of Buenos Aires, Argentina.
- Uwe Kaehler, President of the ISAAC, International Society for Analysis, its Applications and Computations, and University of Aveiro, Portugal.
- Alf Onshuus, President of the SCM, Colombian Mathematical Society, Universidad de Los Andes, Colombia.
- Claudia Garetto, Queen Mary University of London United Kingdom.
- Mitsuru Sugimoto, Member of the Mathematical Society of Japan and Nagoya University Japan.
- Thaís Jordão, University of São Paulo, Brazil.

Confirmed Speakers

- Kristin E. Lauter, Meta
- Jose Raúl Quintero, Universidad del Valle, Colombia
- Thaís Jordão, University of São Paulo, Brazil
- Tohru Ozawa Waseda University, Japan
- Manuel Del Pino University of Bath, UK
- Boris Zilber Oxford, UK
- Felipe Rincón Queen Mary University of London
- Andreas Weiermann Ghent University
- Andrés Villaveces Universidad Nacional de Colombia
- Pavle Blagojević Mathematic institute- Freie Universität Berlin
- Paula Cerejeiras University of Aveiro, Portugal

YouTube links

- Day 1: https://www.youtube.com/watch?v=HJeUklF7R6w&t=13185s
- Day 2, (Part I): https://youtu.be/UuHJ0oJFBlM
- Day 2, (Part II): https://youtu.be/dTrFxEXkAP0
- Day 3: https://www.youtube.com/watch?v=vwZ64axdAyQ&t=15590s
- Day 4: https://www.youtube.com/watch?v=UgnMur-YKbs&t=4s

3 PhD theses

Direct and inverse problems for singular partial differential equations with fractional order integral-differential operators

Toshtemirov Bakhodirjon Khayotjon ugli
joint-PhD Ghent University Belgium - Fergana State University, Uzbekistan
November 21, 2022, 11:00-13:30 Brussels time

Thesis advisors: Prof. Dr. Michael Ruzhansky (Ghent University) and Ass. Prof. Dr. Erkinjon Karimov (Fergana State University)

Summary:

The physical problems involving several variables are mathematically expressed by partial differential equations with specific conditions known as initial or boundary conditions. In this case, for mathematicians, it is interesting to study the existence and uniqueness of a solution, stability and so on.

In this thesis, we are concerned with studying the boundary value problems for fractional partial differential equations (PDEs), particularly, mixed equations involving the subdiffusion involving hyper-Bessel fractional differential operator in Caputo sense and classical wave equation or sometimes wave with fractional order derivative. The application of these types of equations might appear in the problems of aerodynamics and hydrodynamics in terms of presenting transonic flow and also, these equations are used to study gas flow with nearly sonic speeds.

We investigate the existence and uniqueness of a solution in every case. Our main technique is to find the main functional relations from both domains and come to the ordinary differential equations and/or Fredholm integral equations. Moreover, the method of separation of variables is mostly used and using the completeness property of the system of eigenfunctions is applied in many cases. The problems we have solved have differences from each other in the type of fractional differential operator, boundary conditions, domains on which the problems are considered, and the methods for proving the uniqueness of a solution.

This dissertation consists of 4 chapters. In the first chapter, the auxiliary results and the mathematical background are presented. Subsequent chapters are based on 6 papers published in well-respected journals.

In the second chapter, we considered two problems, particularly, the boundary value problem and the nonlocal problem for the mixed equation involving subdiffusion and classical wave equation. In both problems, the integral energy method is used for proving the uniqueness of a solution. In order to show the existence, we derived the Fredholm integral equation which comes from main functional relations. The entire chapter is based on these two papers published in journals "Bulletin of the Institute of Mathematics" and "Montes Taurus Journal of Pure and Applied Mathematics".

Chapter 3 is devoted to the study of 3 nonlocal problems for mixed equations involving with one-dimensional subdiffusion and fractional wave equations. The equations differ from each other with the fractional differential operators, the nonlocal conditions and domains are also taken differently. The main approach is the method of separating variables and the uniqueness of a solution is based on the completeness of the system of eigenfunctions. All these three problems are published with full details in the journals "Mathematical Methods in the Applied Sciences" (joint work with M. Ruzhansky and E. Karimov), "Fractional Differential Calculus", "Uzbek Mathematical Journal" (joint work with

E. Karimov).

The last chapter deals with the two direct and inverse problems for fractional pseudo-parabolic equations. In section 4.1, the nonlocal problem for the Langevin-type equation is discussed. The solution is found in form of Fourier-Legendre series. With the help of the properties of Legendre polynomials, we showed the existence of the solution. The result is published in the journal "International Journal of Applied Mathematics" (joint work with E. Karimov). In addition, the inverse problem determining the time-dependent source term by means of an additional energy measurement is also considered for the same Langevin-type equation. The next section in this chapter discusses the solvability (uniqueness and existence) of direct and inverse problems for the pseudo-parabolic equation for 2D Landau Hamiltonian defined on the plane. Using the global Fourier analysis the theorems of the uniqueness and existence of generalized solutions to the direct and inverse problems are proved. For the inverse problem (determination of a single location-dependent source based on a measurement at the final time) the stability analysis of the solution is also considered. In all problems, we have used the completeness properties of the system of eigenfunctions in order to show the uniqueness of a solution. The paper containing these results has been submitted for publication to the "Georgian Mathematical Journal".

4 History, maths and art, fiction, jokes, quotations ...

4.1 1945–1960, Quinze années d'enseignement des mathématiques

Guy Noëls new book "1945–1960, Quinze années d'enseignement des mathématiques" is published by the SBPMef (Société belge des professeurs de mathématique d'expression française) and can be bought on the website of SBPMef https://www.sbpm.be/2022/09/nouvelles-publications-de-la-sbpmef/.

4.2 Imaginary

Visit this travelling exposition on visible and invisible mathematics:

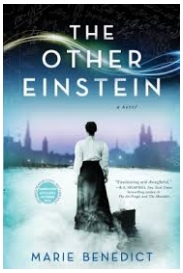
- Diepenbeek 17 November - 22 December 2022
- Antwerpen 23 January - 17 February 2023
- Leuven 27 February - 26 March 2023
- Brussel 15 April - 13 May 2023

See all information at https://www.imaginarymaths.be/

4.3 Adhemar's corner

Next follow two reviews by Adhemar. One on a fictional biography of Mileva Maric, Einstein's first wife, based on the idea that she was an essential coauthor of Einstein's relativity theory papers, *The other Einstein* of M. Benedict. The second one is on *Bicycle or unicycle* of D.J. Velleman and S. Wagon, a collection of mathematical problems and puzzles from the Macalester College Weekly Problems and a sequel to the book *Which way did the bicycle go?* (MAA, 1996).

The other Einstein by *Marie Benedict*, Sourcebooks Landmark, 2017 (304 p.)




Marie Benedict

Marie Benedict is an alias for Heather Benedict Terrell, an American author married to Jim Terrell. She writes also under the name Heather Terrell. Several of her novels have an historical background with a woman as the main character. In this book the women is Mileva Marić, Einstein's first wife.

These are the facts. Mileva is born in Titel (now in Serbia) in a wealthy family. She was good in mathematics and physics and so she joined the ETH in Zürich. As students, Einstein and Mileva shared their love for science and gradually it turns into a relationship. Mileva gets pregnant of a girl Lieserl, born in 1902. They marry in 1903 when Albert, now graduated, had a job at the patent office. Mileva however failed her final exam. In 1905 Einstein published his papers on relativity theory and was offered several professorships. Mileva gave birth to two more boys: Hans Albert and Eduard. Einstein starts an affair with his cousin Elsa Löwenthal, and divorced from Mileva in 1916. Einstein gave the money of his 1921 Nobel Prize to Mileva who got the custody of the two boys – Lieserl's faith is uncertain but she possibly died from scarlet fever as a baby. Speculation is that Mileva may have contributed, at least to some extent, to the papers that were published under Einstein's name. This should have entitled her to half of the Prize.

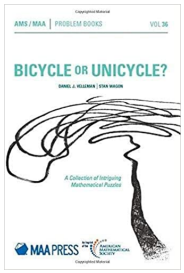
Benedict has constructed this novel based on this idea. So, the 'other Einstein' of the title may refer to Mileva being the other author (she even claims the main author) of Einstein's papers. She was as smart as Einstein and even better in mathematics. It may also refer to another, unknown dark side of Eintein as a selfish, heartless husband with little or no empathy or respect for his wife. Benedict depicts the young Mileva as a shy girl with a club foot who falls head over heels in love with Einstein who initially is interested in her as as a bright fellow science student and being the only female in the class. Given her handicap, Meleva's father has prepared her for a future as a scientist, assuming she would never find a husband. About half the book reads like a young adult love story. But when she is pregnant of Lieserl Einstein gradually looses interest in her and she becomes a burden, except to scientific collaboration as a couple 'Bohemian scientists'. Because of her pregnancy sickness she fails her exam and she returns to her parents to give birth. Her father eventually convinces her to return to Albert who warns her not to bring Lieserl with her. They works together on the 1905 papers. When she is informed that Lieserl caught scarlet fever she travels back to her parents, but the girl dies. Einstein never shows any compassion. He only thinks about physics. After Mileva returns to Albert, they decide to marry. When the reprints arrive of what she thinks to be their joint paper, she is devastated to see only his name as the sole author. Even though she first tries to keep up with scientific literature she has to give up all hope to find some satisfaction in doing mathematics or physics. She is reduced to being 'the wife of' taking care of the children, the household, to clean up Albert's mess, and to serve and entertain the many visitors. She is miserable in unhealthy Prague where Einstein had accepted a position.

She accidentally finds a confidential correspondence between Einstein and his cousin Elsa from Berlin, just widowed. But she forgives him yet once more. The classical 'for the children's sake' still keeps them together, but when they move to Berlin where Einstein accepts a position, he makes a contract that enumerates all her duties and tasks, reducing her to an employed housekeeper. The divorce is now unavoidable.

Benedic sketches here Einstein as a really detestable male exploiter of women. So, the love story aspect of the first part turns into a feminist pamphlet. There is no mathematics or physics explained. Even though it is the only thing Mileva and Einstein seemed to have had in common. There are at most some vague references, so you should not read this for the scientific aspects, and I doubt that the reality is as it is told in this book. It only relies of circumstantial evidence and invented events manipulated to obtain a enforced dramatic effect.

Adhemar Bultheel

Bicycle or unicycle? by *Daniel J. Velleman and Stan Wagon*, MAA/AMS, 2020 (xvi+286 p.), isbn: 9781470447595. Problem Books vol. 36



D. Velleman

S. Wagon

Since 1968, Joe Konhauser at the Macalester College (a private liberal arts college in Saint Paul, Minnesota) started weekly posting a mathematical problem. Since 1993 Stan Wagon took over. After his retirement, he kept mailing problems to subscribers, although not on a weekly basis. A collection from the first 21 years of the archives was published with the title *Which way did the bicycle go?* (MAA, 1996). It refers to the now well known problem where Sherlock Homes has to find out from the tracks of the two wheels of a bicycle in which direction the bicycle went. This book is a new selection from the Macalester archives. The title refers again to a bicycle problem: can a bicycle track generate a single track like a unicycle does?

The book contains a collection of 105 diverse challenging mathematical puzzles that can be solved with rather elementary mathematics, but by pushing the problem a bit further, one may easily arrive at more demanding mathematics. Problems are somewhat comparable to some of the mathematical olympiads, or the Putnam competition problems.

The solution of a problem is often surprising so that guessing a solution does not work in general. The book starts by posing the problems, subdivided into 8 different chapters. The bicycle problem is the starter. Subsequent chapters refer to the mathematics involved: geometry, number theory, calculus,.... The problem settings are usually rather short (only the first 50 pages for the 105 problems). The larger second part of the book consists of a discussion of the solutions. Some solutions are simple and concise, but others (like the cycle problem) is extensively treated.

The solution of the cycling problem, when it is not a straight path, requires the solution of a differential equation and in particular to define the angle of the front wheel as a function of time. Some solutions are simple, but a general solution is quite surprising.

S. Wagon on a bike

Some of the problems are set in classical mathematical terms, others as a narrative puzzle of cutting pizzas, weighting coints, etc. An example of the first kind is asking the path of the focal point when the parabola $y = x^2$ rolls without sliding over the x-axis. This relates again to a cycling problem for a bike with square wheels. In another one, one has the prove that 3^{3^n} is a sum of two integer squares.

An example of a more puzzler's type problem is a baby version of public key encryption. Charlie deals seven cards 1,2,3,4,5,6,7: 3 to Alice and 3 to Bob, keeping one. Each can only see their own cards. What public statement can Alice make so that Bob knows her cards, while Charlie does not? The greater challenge is to solve the problem for n cards where n is odd and Charlie keeping one card while Alice and Bob each get $(n-1)/2$. There is also a revision of the Monty Hall problem, where there are four instead of three doors with a prize behind one of them. You choose a door and Monty shows you another one without a prize. You are allowed to choose another door but you do not. Then Monty shows you another door without the prize. Should you switch then or not?

There are also problems based on physics laws. For example, a heavy block of mass M is to the right of a small block of mass m. To the left of the small block is a wall. The mass M is pushed to the left, hitting m, making it bounce back and forth between the wall and M. Gliding is frictionless and all collisions are perfectly elastic. How many times collides the smaller block with the wall and M? The appearance of π in the solution is a surprise, don't you think?

Where possible, the origin of the problem is added. There are e.g. problems from national Math Olympic team selection competitions, others are taken from the literature. There is a list of 134 references for further reading about the problems and their generalizations.

Adhemar Bultheel