



Newsletter

BELGIAN MATHEMATICAL
SOCIETY

143, May 15, 2023

Comité National de Mathématique CNM

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NCW Nationaal Comité voor Wiskunde



By Andreas Weiermann

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

Belgian Mathematical Society ASBL/VZW
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The next edition of this newsletter will appear on September 15th, hence, till September 8th all content can be sent to wendy.goemans@kuleuven.be.

Foreword

Dear colleagues and friends,

Let me take the opportunity of the first foreword I write to you as president of the BMS, to express some words of gratitude towards the previous BMS president Yvik Swan. Over the last 6 years, Yvik has been leading the BMS in an excellent way, first as vice president and later as president. During this period, the BMS did undergo some important changes and several new initiatives were taken, let me mention just a few. Firstly we transformed from an actual association without any legal status into a non-profit organization (“absl” in French or “vzw” in Dutch). This transition did not truly change the way the BMS is operating, but it was a necessary change which unfortunately also comes with some additional administrative tasks. Probably more visible for BMS members is that under the impetus of Yvik, the BMS installed the “Young Scholar Award”, which recognizes the work of a promising mathematician in Belgium. The two first recipients of this award were Mitia Duerinckx in 2021 and Daniel Drimbe in 2022. The latter was one of the four highly appreciated speakers at our “recent breakthroughs meeting” which we held along with the general assembly in the palace of the Royal Academy in Brussels on March 29.

I hope you will enjoy reading our newsletter and I would like to ask you to mark already the date of 20 December 2023 in your agenda. On that day we plan a “Young Scholar day”. Also, we will have another edition of the “PhD day” in 2024 which will take place in Antwerp. More detailed information about these and other future events will follow later, so look out for our next newsletter(s) !

Joost.

1 News from the BMS & NCM

1.1 Save the date ...

... of the “Young Scholar day” on 20 December 2023. Further information will follow.

1.2 News from the EMS

About the Committee for Applications and Interdisciplinary Relations (CAIR) of the European Mathematical Society (EMS): A key task in the CAIR agenda is to ensure that mathematicians in Europe are fully aware of the fact that the EMS is concerned with all areas of mathematics and in particular is highly interested in bringing together colleagues working in applications and on interdisciplinary research. Having mathematics and its role in applications duly represented within the society is essential for the EMS to fulfil its mission and accordingly CAIR would very much like to encourage anyone interested in mathematics in the broad sense to become members of the EMS.

Some of the benefits of becoming a member of the EMS are:

- Access to funding for organising European meetings in mathematics.
See <https://euromathsoc.org/scientific-activities> for details.
- The opportunity to join the EMS topical activity groups (TAGs) that are currently being established, and through the TAGs to network, exchange and collaborate with colleagues across Eu-

- rope. See <https://euromathsoc.org/EMS-TAGs> for details.
- The EMS Young Academy (EMYA) is another recently established entity that provides early career mathematicians with the opportunity to engage in the organisation of the EMS, network on a European level and establish new activities for mathematicians in Europe. See <https://euromathsoc.org/EMYA> for details.
 - Joining the European collaboration between the EMS, the European Consortium for Mathematics in Industry (ECMI) and EU-MATHS-IN, to foster and promote industrial mathematics throughout Europe.
 - The EMS publishes news on European mathematics in a monthly newsletter called EMS-Digest <https://euromathsoc.org/news> and in the EMS Magazine <https://euromathsoc.org/magazine> which appears four times per year. EMS members have access to these news channels for staying up-to-date on mathematical activities in Europe as well as a mean for bringing their own activities and research breakthroughs to the attention of European colleagues.

To become a member this can either be done via the EMS website, <https://euromathsoc.org/individual-members>, or via a joint membership with your own society in case it exists. The fee for individual EMS members is 25 EUR per annum.

1.3 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 29 (3) december 2022

- Application of Pythagorean means and Differential Subordination **Shanmugam Sivaprasad Kumar, Priyanka Goel** DOI: 10.36045/j.bbms.210605
- On sequence space representation and extension of vector-valued functions **Karsten Kruse** DOI: 10.36045/j.bbms.211009
- On some perturbed $D_{fl\omega}$ -semiclassical orthogonal polynomials **Emna Abassi, Lotfi Khériji** DOI: 10.36045/j.bbms.211203
- The Action of the Thompson Group F on Infinite Trees **Jeong Hee Hong, Wojciech Szymański** DOI: 10.36045/j.bbms.211208
- Slow-fast torus knots **Hildeberto Jardón-Kojakhmetov, Renato Huzak** 10.36045/j.bbms.220208
- Cardinal inequalities with Shanin number and π -character **Ivan Gotchev, Vladimir Tkachuk** DOI: 10.36045/j.bbms.220321a
- Characterization and some properties of von Neumann-Schatten p -Bessel sequences **Farkhondeh Takhteh, Morteza Mirzaee Azandaryani** DOI: 10.36045/j.bbms.220511

Content Volume 29 (4) december 2022

- Very ample linear series on quadrilateral curves **Marc Coppens, Gerriet Martens** DOI: 10.36045/j.bbms.210506a
- A note on cofinite modules over Noetherian complete local rings **Gholamreza Pirmohammadi** DOI: 10.36045/j.bbms.210709
- Non-surjective coarse embeddings of continuous functions spaces **Igor A. Vestfrid** DOI: 10.36045/j.bbms.211006

- Existence and multiplicity of nontrivial solutions for a class of Kirchhoff-Schrödinger-Poisson systems **Guofeng Che, Haibo Chen** DOI: 10.36045/j.bbms.211028
- Endomorphisms of real Grassmannians that commute with Steenrod squares **Matej Milićević, Marko Radovanović** DOI: 10.36045/j.bbms.211212
- Cardinal Functions, Bornologies and Strong Whitney convergence **Tarun Kumar Chauhan, Varun Jindal** DOI: 10.36045/j.bbms.220204
- On optimal solutions of the Borel problem in the Roumieu case **David Nicolas Nenning, Armin Rainer, Gerhard Schindl** DOI: 10.36045/j.bbms.220322
- Density of polyanalytic polynomials in complex and quaternionic polyanalytic weighted Bergman spaces **Sorin G. Gal, Irene Sabadini** DOI: 10.36045/j.bbms.220502
- Inner Amenability of the subgroups of $PL^+(I)$ **Hajer Hmili, Isabelle Liousse** DOI: 10.36045/j.bbms.220704

Content Volume 29 (5) december 2022

- Note on a parabolic problem with multi-coupled nonlinearity and space-time weighted functions **Bingchen Liu, Ke Li, Fengjie Li** DOI: 10.36045/j.bbms.211019a
- Nuclear operators and Baire vector measures **Marian Nowak** DOI: 10.36045/j.bbms.211119
- Approximate Birkhoff orthogonalities in normed spaces **Paweł Wójcik** DOI: 10.36045/j.bbms.220428
- Singular impasse points of planar constrained differential systems **Otávio Henrique Perez, Paulo Ricardo da Silva** DOI: 10.36045/j.bbms.220602
- Algebraic and combinatorial properties of generalized bi-polymatroidal ideals **Monica La Barbera, Roya Moghimipor** DOI: 10.36045/j.bbms.220604
- Modes of convergence in nets, counterexamples, and lineability **José Carmona Tapia, Juan Fernández-Sánchez, Ruben Fiñana, Juan Benigno Seoane-Sepúlveda** DOI: 10.36045/j.bbms.220801
- Fréchet subspaces of minimal usco and minimal cusco maps **Łubica Holá, Branislav Novotný** DOI: 10.36045/j.bbms.221005

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

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

2.1 June 2023

Groups, Rings and the Yang-Baxter equation 2023

June 10-23, 2023, Duinse Polders, Blankenberge

The conference about “Groups, Rings and the Yang-Baxter equation 2023” will be held at Corsendonk Duinse Polders in the beautiful town of Blankenberge, Belgium. This international conference is a sequel to the meetings held in 2017 and 2019 at Corsendonk Sol Cress, Spa, Belgium concentrating on recent developments in and the interplay between the areas of ring theory and group theory, with a focus on the methods involved in their study and applications to other areas, mainly related to the celebrated YBE.

The list of keynote speakers includes Eli Aljadeff, Peter Cameron, César Galindo, Harald Helfgott, Leo Margolis, Jan Okniński, Julia Plavnik, Aner Shalev, Agata Smoktunowicz, Simon Wood.

Organizing Committee:

Ilaria Colazzo (University of Exeter, UK),
Fateme Mohammadi (KU Leuven, Belgium),
Arne Van Antwerpen (Vrije Universiteit Brussel, Belgium),
Leandro Vendramin (Vrije Universiteit Brussel, Belgium).

Scientific Committee:

Nigel Byott (University of Exeter, UK),
Kenny De Commer (Vrije Universiteit Brussel, Belgium),
Anastasia Doikou (Heriot-Watt University, UK),
Fateme Mohammadi (KU Leuven, Belgium),
Jan Okninski (University of Warsaw, Poland),
Julia Plavnik (Indiana University in Bloomington, USA),
Leandro Vendramin (Vrije Universiteit Brussel, Belgium).

Local Organizers:

Ilaria Colazzo (University of Exeter, UK),
Carsten Dietzel (University of Stuttgart, Germany),
Thomas Letourmy (Universite Libre de Bruxelles, Belgium),
Kevin Piterman (University of Marburg, Germany),
Silvia Properzi (Vrije Universiteit Brussel, Belgium),
Senne Trappeniers (Vrije Universiteit Brussel, Belgium),
Arne Van Antwerpen (Vrije Universiteit Brussel, Belgium).

Conference Website: <http://ilariacolazzo.info/gryb2023/>

Conference Center Corsendonk Duinse Polders:

<https://corsendonkhotels.com/en/location/corsendonk-duinse-polders/>

2.2 July 2023

PADGE 2023

July 10-14 2023, KU Leuven

From July 10 till July 14, 2023, the conference “Pure and Applied Differential Geometry - PADGE 2023” will take place at KU Leuven, Belgium. All information will be available on the website

<https://wis.kuleuven.be/events/padge-2023/padge2023>

2.3 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 on

campus. The conference aims at bringing together junior and senior researchers from the broad area of integrable systems and its interactions with geometry, topology, algebra, and mathematical physics.

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).

The **deadline for contributed talks and/or funded accommodation is April 16, 2023**. More information (including the registration links) can be found on the poster at the end of this newsletter and on the conference webpage

<https://www.uantwerpen.be/fdis2023>

ALGAR 2023: Local-global principles for quadratic forms summer school

August 17-18 and 21-25, 2023, UAntwerpen

Summer school on local-global principles for quadratic forms. See all information on

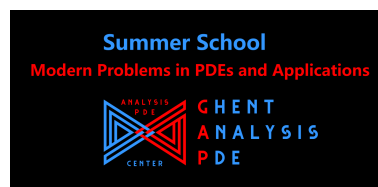
<https://www.uantwerpen.be/en/summer-winter-schools/algar/>

The main lecturers are:

Nicolas Daans (Charles University, Prague, Czechia)
Diego Izquierdo (École Polytechnique, Paris, France)
Vlerë Mehmeti (Sorbonne Université, Paris, France)
Raman Parimala (Emory University, Georgia, USA)

Summer School “Modern Problems in PDEs and Applications”

23 August - 2 September, 2023, Ghent Analysis & PDE Center Ghent University



Description: The school will be devoted to the study of new techniques and approaches for solving partial differential equations, which can either be considered or arise from the physical point of view or the mathematical perspective. Both sides are extremely important since theories and methods can be developed independently, aiming to gather each other in a common objective. The summer school aims to progress and advance in the problems considered. Note that real-world problems and their applications are classical study trends in physical or mathematical modelling.

With this event, Ghent university will be a host to a diversity of cultures. The summer school will be organised in a friendly atmosphere and synergy, and it will be an excellent opportunity to promote and

encourage the development of the subject in the community. Furthermore, close contact with world-wide experts will stimulate participants' skills in independent research and collaborations with other researchers. Frequently, schools also lead to some excellent possibilities for collaborations with experts in Europe and other continents, which work on related topics. Moreover, it shall enhance further collaborations established during this program. Through these collaborations, the expertise held by the European mathematical community can grow and expand to international interest in the topic. It will bring considerable benefit in the future development of the academic career for the participants while enriching competitiveness.

Announcement at www.summerschoolsineurope.eu

Information for participants: For attending the school, the charge is 10 euro per day to cover organisational expenses. The participation of PhD candidates from Doctoral Schools at UGent, colleagues from UGent, and Lecturers is free of charge.

If you need administrative support (visa, accommodation, etc.) for your attendance, please let us know in advance. **Contact person:** Ms Kim Verbeeck, kimpj.verbeeck@ugent.be

Organisers (Ghent Analysis & PDE Center): Michael Ruzhansky, Karel Van Bockstal, Marianna Chatzarakou, Joel Restrepo, Berikbol Torebek

PhD organising committee: Irfan Ali, Junqing Huang, David Santiago Gómez Cobos

Conference secretary: Ms Kim Verbeeck

Scientific Committee: Prof. Michael Ruzhansky, Prof. Marian Slodicka, Prof. Hans Vernaev, Prof. Hendrik De Bie

Support The summer school is supported by a grant from the Ghent University:

DOCTORAL SCHOOLS



It is also partially supported by the FWO Odysseus and UGent Methusalem projects "Analysis and Partial Differential Equations":



Brussels Summer School of Mathematics 2023

August 30 - September 1, 2023, ULB

The *Brussels Summer School in Mathematics* (or *BSSM*) is an event organized yearly at the end of August where diverse mathematical talks happen (algebra, analysis, differential geometry, topology, mathematical physics...).

This year the BSSM will be from August the 30th to September the 1st. The talks are sometimes in French, sometimes in English and are given by both young researchers (PhD students and Postdocs) and by professors.

The goal is not to propose any formation about one theory or the other, but to discover a multitude of interesting mathematics. The presentations are accessible to bachelor students.

More informations are available on our [Website](#) and on our [Facebook Page](#).

2.4 September 2023

Finite Geometry and Friends

September 18-22, 2023, Vrije Universiteit Brussel

This summer school will be centered around lectures given by Anna-Lena Horlemann (University of Sankt Gallen), Krystal Guo (University of Amsterdam), Valentina Pepe (Universita di Roma La Sapienza), John Sheekey (University College Dublin).

Each of them will deliver four hours of lectures on topics in their domain of expertise. Attending students and researchers will encounter a variety of topics, including

- Substructures of finite geometries
- Geometric aspects of tensors, semifields, Segre and Veronese varieties, and rank metric codes
- Code based cryptography
- Quantum information, quantum walks, state transfer
- Graph theory; eigenvalues of graphs, linear algebra and graph theory, matrix algebras of graphs, cospectral vertices, distance regular graphs, generalized quadrangles

Organizing Committee: Sam Adriaensen, Jan De Beule, Leen Demuys, Sam Mattheus, Jonathan Mannaert.

Official registration for the summer school is now open and is possible online through

<https://www.vub.be/en/event/brussels-summer-school-finite-geometry>

The deadline for registration is August 15, 2023. The registration fee is 210 euro and includes participation, 5 lunches (Monday - Friday), coffee breaks, a conference package, and the conference dinner. All further information can be found on the website of the summer school

<http://summerschool.fining.org>.

2.5 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

Junior Methusalem Seminar
KU Leuven
May 25, 13:00-14:30, aula 200L 00.07

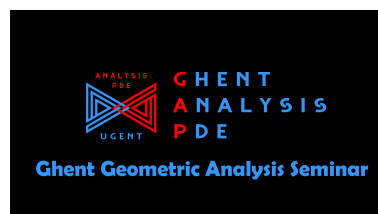
Vira Raichenko from University of Potsdam will give a live talk Introduction to Topological Data Analysis and its Applications

Abstract. Topological Data Analysis is a combination of topological, geometrical, and statistical tools that helps us to make sense of complex and messy real-world data. In this talk, I will focus on giving an overview of the most popular tools from applied algebraic topology such as simplicial complexes and persistent homology. I will demonstrate how putting raw data into such a mathematical framework can reveal hidden patterns in silk-worm cocoons and how persistent homology can improve the predictive power of neural networks.

This time we would like to make an experiment and split the talk in two parts of 45 min with a 5 min brake: the first will be addressed to the general audience, whilst in the second Vira will tell us more about her own research.

The talk will be streamed via KU Leuven Livestream. We will send a link one day before the seminar.

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/>

Upcoming seminars:

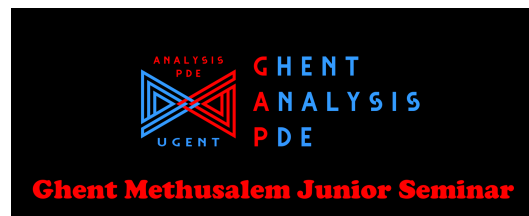
- Sundaram Thangavelu, Indian Institute of Science, India.
- Eckhard Meinrenken, University of Toronto, Canada.
- Gerald Folland, University of Washington, US.
- Sylvie Paycha, Institut für Mathematik, University of Potsdam, Germany.
- Elmar Schrohe, Leibniz Universität Hannover, Germany.

Organisers:

- Duván Cardona Sanchez (Duvan.CardonaSanchez@UGent.be).
- Gihyun Lee, Ghent University, (gihyun.lee@ghent.ac.kr).
- 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 Wednesday 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:

- Duván Cardona Sanchez (Duvan.CardonaSanchez@UGent.be).
- Serena Federico (serena.federico2@unibo.it)
- Vishvesh Kumar (Vishvesh.Kumar@UGent.be)
- David Rottensteiner (David.Rottensteiner@UGent.be)
- Bolys Sabitbek (b.sabitbek@qmul.ac.uk).

The following talks took place till now in the second term of the academic year 2022/23.

- Felipe Ponce Vanegas (Basque Center for Applied Mathematics, Spain)
- Adolfo Arroyo Rabasa (UCLouvain, Belgium)
- Gisel Mattar (University of Göttingen, Germany)
- Stefano Bucci (University of Vienna, Austria)
- Arrick Shao (Queen Mary University of London, UK)
- Mirco Piccinini (Università di Parma, Italy)
- Tobias König (Goethe University Frankfurt, Germany)
- Anthony Baptista (Queen Mary University of London and Alan Turing Institute, UK)
- Louis Yudowitz (Queen Mary University of London, UK)

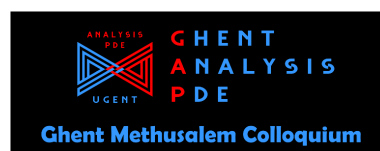
The following are the upcoming talks.

- Joonhyun La (Imperial College London, UK)
- Irina Shafkulovska (University of Vienna, Austria)
- Arick Shao (Queen Mary University of London, UK)
- Dominique Maldague (MIT, USA).

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



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:

- Sundaram Thangavelu, Indian Institute of Science, India.
- Sylvie Paycha, Institut für Mathematik, University of Potsdam, Germany.

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”.

3 PhD theses

Graded pointed Hopf algebras, PBW bases and noncommutative binomial theorem

Huan Jia

June 12, 2023

Thesis advisors: Prof. Dr. Yinhuo Zhang (University of Hasselt) and Prof. Dr. Naihong Hu (East China Normal University)

Summary:

One of pure structure constructions of Hopf algebras is to generate a free Hopf algebra (or a bialgebra) by a coalgebra. Such a free Hopf algebra is usually too big to have nice properties. So we usually consider its quotient Hopf algebras. This construction method produces a large number of examples of pointed Hopf algebras, such as quantum groups.

This PhD thesis consists of two parts: (1) In order to study the quotient Hopf algebras (different from quantum groups) of the pointed free bialgebra \mathcal{T} with PBW bases and GK-dimensions, we use the Lyndon words and the Lyndon-Shirshov basis to study the shuffle type polynomials determining the coproducts of those quotients. In this way, we obtain a free noncommutative binomial theorem, which is strongly related to the well-known Bell polynomials. The related combinatorial results show that the free noncommutative Faà di Bruno bialgebra is a sub-bialgebra of \mathcal{T} , and the quotient bialgebra $\overline{\mathcal{T}}$ is an Ore extension of the well-known Faà di Bruno bialgebra. Moreover, a more reasonable noncommutative version of the Faà di Bruno bialgebra is established. Furthermore, we obtain a chain of quotient Hopf algebras of $\overline{\mathcal{T}}$ with finite GK-dimensions over fields of positive characteristic. We study homological properties and the coradical filtrations of those quotients.

Based on the relation between \mathcal{T} and the Faà di Bruno bialgebra, we generalize the Faà di Bruno Hopf algebra and the related binomial formula from the point view of pointed Hopf algebras.

(2) Rosso and Kharchenko gave the PBW bases for graded pointed Hopf algebras generated by grouplikes and skew-primitives; Zhou–Shen–Lu gave the PBW bases and structure of graded connected Hopf algebras. Inspired by their work, we use the quantum Lyndon-Shirshov basis to study the PBW bases and the structure of a class of graded pointed Hopf algebras of diagonal type (not necessarily generated by grouplikes and skew-primitives), including graded connected Hopf algebras, the generalized Faà di Bruno Hopf algebras, etc..

4 Job announcements

4.1 From UGent

Assistent vacature

<https://jobs.ugent.be/job/Gent-Assistent-9000/769574002/>

Postdoc vacancy

Nederlandse versie: <https://jobs.ugent.be/job/Gent-Doctor-assistent-9000/769577402/>

English version: <https://jobs.ugent.be/job/Ghent-Post-doctoral-assistant-9000/769577302/>

Deadline for applications: May 23.

4.2 From ULB

Positions for assistants at ULB:

English versions: <https://cwfront.ulb.ac.be/greffe/modules/vac/data/sources/pdf/prod/8306.pdf>

<https://cwfront.ulb.ac.be/greffe/modules/vac/data/sources/pdf/prod/8304.pdf>

French versions: <https://cwfront.ulb.ac.be/greffe/modules/vac/data/sources/pdf/prod/8305.pdf>

<https://cwfront.ulb.ac.be/greffe/modules/vac/data/sources/pdf/prod/8303.pdf>

5 News from the universities and other societies

5.1 Honorary doctorate for Efim Zelmanov at VUB

On Thursday 1 June, the Vrije Universiteit Brussel will award five honorary doctorates to pioneering scientists and socially engaged personalities under the theme 'Science and Freedom'. One of the Doctores Honoris Causa is Efim Zelmanov.

Professor Efim Zelmanov is a Russian-American mathematician known for his work on combinatorial problems in algebra and group theory, including his solution to the Burnside problem. He made fundamental contributions to the theory of Jordan algebra, introduced to physics in the 1930s. He also made crucial contributions to the theory of Lie algebras, again finding solutions to major problems that mathematicians had thought impossible. He introduced new ideas, concepts and techniques and is undoubtedly one of the world's greatest algebra specialists. Prof Zelmanov was appointed the Rita L. Atkinson Chair in Mathematics at UC San Diego in 2002. Before that, he was professor at Yale University, University of Chicago and the University of Wisconsin-Madison. He has received numerous prestigious awards, including the highest distinction in mathematics, the Fields Medal, in 1994.



The day after the ceremony celebrating Zelmanov's honorary doctorate at VUB, we will have a mathematical seminar. Apart from Zelmanov's talk, three other speakers will discuss different aspects of his work.

Organizers Ann Dooms and Leandro Vendramin

Date and place June 2, 2023, 10 am

Vrije Universiteit Brussel

Pleinlaan 2, B-1050 Brussel

Room G.1.52

Schedule

- 10.00 Efim Zelmanov
- 11.00 Coffee Break
- 11.30 Agata Smoktunowicz
- 12.30 Lunch
- 14.00 Bettina Eick
- 15.00 Coffee Break
- 15.30 Eric Jespers

Abstracts

Eric Jespers

The structure algebra of a set-theoretic solution of the Yang-Baxter equation

The structure algebra over a field K associated to a map $r : X \times X \rightarrow X \times X$ is the K -algebra $A(X, r)$ with generators X and relations $xy = uv$ whenever $r(x, y) = (u, v)$. So it has a presentation defined by quadratic word relations and thus it is the monoid algebra of the structure monoid $M(X, r)$, i.e. the monoid generated by the set X and subject to the same word relations. This algebra is the associative ring theoretic tool to investigate the map r and has attracted a lot of attention in case r satisfies the braided relation, i.e. (X, r) is a set-theoretic solution of the Yang-Baxter equation. Fundamental results have been proven for algebras of such solutions. For example, if X is finite and r is bijective and non-degenerate, then the algebra satisfies a polynomial identity and is left and right Noetherian and has finite Gelfand-Kirillov dimension. If, furthermore, r is involutive then these algebras share many properties with polynomial algebras in commuting variables. The aim of this lecture is to explain the intriguing relationship between the algebraic structure of the structure algebras $A(X, r)$ and the finite left non-degenerate set-theoretic solutions (X, r) of the Yang-Baxter equation. The main focus is on when such algebras are Noetherian, prime, semiprime, representable and the Gelfand-Kirillov dimension.

Efim Zelmanov

Automorphisms and derivations of affine commutative algebras

Let A be an affine commutative algebra. The group of automorphisms $\text{Aut}(A)$ is, generally speaking, not linear and the Lie algebra $\text{Der}(A)$ of all derivations of A may be infinite dimensional. The talk will focus on the question: which properties of linear groups extend to $\text{Aut}(A)$ and which properties of finite dimensional Lie algebras extend to $\text{Der}(A)$?

Agata Smoktunowicz

Some open questions and results on nil and nilpotent rings

In this talk I will mention some important results by the Fields medallist Efim Zelmanov, related to

various types of nil rings: Lie rings, pre-Lie rings and noncommutative associative rings. Recall that a ring is nil if each element of this ring to some power is zero. Various types of nilpotency of rings will also be mentioned. We will also look at some connections between nil and nilpotent rings and other research areas such as group theory, deformation theory, algebraic geometry and theory of braces and the Yang-Baxter equation, and show how some classical results can be applied in these research areas.

Bettina Eick

Finite p -groups: History, Computations and Classifications

The classification of finite groups of prime-power order (finite p -groups) is a deep and interesting research area in algebra. This talk describes different approaches towards this aim, their historic roots, some highlight results and it also exhibits interesting open problems in the area.

5.2 Research Perspectives Ghent Analysis and PDE Center



There is a new series in Birkhäuser/Springer, associated to our Ghent Analysis and PDE Center: Research Perspectives Ghent Analysis and PDE Center. This series is located within Birkhäuser's Trends in Mathematics series.

Series description:

Research Perspectives Ghent Analysis and PDE Center is a book series devoted to the publication of extended abstracts of seminars, conferences, workshops, and other scientific events related to the Ghent Analysis and PDE Center. The extended abstracts are published in the subseries Research Perspectives Ghent Analysis and PDE Center within the book series Trends in Mathematics. All contributions undergo a peer-review process to meet the highest standard of scientific literature.

Volumes in the subseries will include a collection of revised written versions of the communications or short research announcements or summaries, grouped by events or by topics. Contributing authors to the extended abstracts volumes remain free to use their own material as in these publications for other purposes (for example a revised and enlarged paper) without prior consent from the publisher, provided it is not identical in form and content with the original publication and provided the original source is appropriately credited.

Type of papers: Here is some more information on the type of the papers:

Each paper is 3-8 pages long (including title and references), the upper limit of 8 pages is strict. It is expected that the paper is of an extended abstract type, namely: one can make a short research summary or announce some results without proofs. The idea is similar to publishing in journals like e.g. C.R.A.S. Paris, *Funct. Anal. Appl.*, or *Doklady RAN*. Therefore, publishing a paper in this volume does not influence the publication of a full research paper, which can be published as usual elsewhere. The papers in the volume should be included in Scopus, MathSciNet and Zentralblatt. Publication is free of charge, authors should get free electronic access to the whole volume.

Forthcoming volumes:

- Volume title: Extended Abstracts MWCAPDE 2023
Volume subtitle: Methusalem Workshop on Classical Analysis and Partial Differential Equations
Volume editors: Michael Ruzhansky and Berikbol Torebek
- Volume title: Extended Abstracts 2021/2022
Volume subtitle: Methusalem Lectures
Volume editors: Duván Cardona, Joel Restrepo, Michael Ruzhansky
- Volume title: Extended Abstracts 2021/2022
Volume subtitle: Ghent Analysis and PDE Seminar
Volume editors: Michael Ruzhansky, Karel Van Bockstal
- Volume title: Women in Analysis and PDE
Volume editors: Marianna Chatzakou, Michael Ruzhansky, Diana Stoeva
- Volume title: Analysis and PDE in Latin America
Volume subtitle: ICMAM 2022 Latin America
Volume editors: Duván Cardona, Brian Grajales

Further information will appear on the website:

<https://analysis-pde.org/research-perspectives-ghent-analysis-and-pde-center/>



5.3 “Mathematics for Industry” study week

We are thrilled to announce our second Belgian “Mathematics for Industry” study week, which will take place from 11 - 15 September 2023 at the U-residence (VUB campus Etterbeek) in Brussels.

Concept The “Mathematics for Industry” study week is organized by the Belgian BE-MATHS-IN network (and supported by Platform Wiskunde Vlaanderen), which gathers researchers at all Belgian universities working on applied mathematics for industry and innovation. The study week is an intensive problem-solving workshop that brings together researchers of different backgrounds (engineers, mathematicians, physicists, statisticians, ...) to work in small groups of 4-6 researchers on real-world challenges provided by industry. You can find more info on our website: <https://be-maths-in.be/mfi23/>.

Registration Registrations are currently open! To register for this exciting week, please head to: <https://be-maths-in.be/mfi23/registration>

Participating in the study week (incl. catering) is entirely free of charge; we only impose a fine of 50 EUR in case of no show or late cancellation.

Accommodation Thanks to our sponsors, we can offer very comfortable accommodation in one of the comfortable hotels close by, for which we only request a fixed (but small) fee of 150 EUR. We accept accommodation requests until 15 August 2023.

Contact

If you have any questions or comments, please forward them to studyweek@be-maths-in.be.

5.4 Modern perspectives in Proof Theory

Royal Society Publishing has recently published special issue of Philosophical Transactions A entitled *Modern perspectives in Proof Theory* compiled and edited by J P Aguilera, F Pakhomov, A Weiermann and the articles can be accessed directly at <https://royalsocietypublishing.org/toc/rsta/2023/381/2248>.

Purchase the print issue at the reduced price of £40 per issue by contacting sales@royalsociety.org.

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

6.1 Modern mathematics. An international movement?

Dirk De Bock (KU Leuven) edited a new publication in the History of mathematics education series of Springer Cham: *Modern mathematics. An international movement?*, doi: [10.1007/978-3-031-11166-2](https://doi.org/10.1007/978-3-031-11166-2)

6.2 Problem of the week

Ali Imad Raad (ali.imadraad@kuleuven.be) runs a “Problem of the week”, see below this week’s problem and instructions on how to be put on the mailing list to receive this weekly in your mailbox.

Problem of the Week

Paint the Polygon

Week 20 2023

To subscribe to the mailing list, send an email to listserv@ls.kuleuven.be with the message (in place of Your Name you put your actual name):

SUBSCRIBE ProblemOfTheWeek Your Name

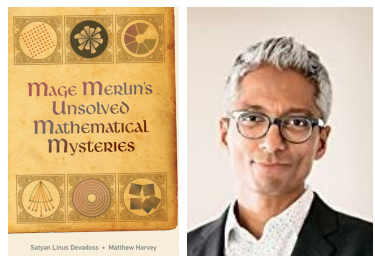
Consider a regular 2023-gon (i.e. a regular polygon with 2023 sides). Lise colours the sides of this polygon consecutively as red, blue, red, blue, . . . , red, blue, green. After Soham sees the polygon, he tells Lise he would rather it be coloured consecutively as red, blue, red, blue, . . . , red, green, blue. So Lise gives Soham the paint brush and her three colours red, blue and green and tells him he can recolour the edges one at a time, but only under the condition that no two consecutive edges have the same colour after each colouring step. Can Soham achieve his desired colour configuration?

6.3 Adhemar’s corner

The review of Adhemar is on unsolved mathematical problems simply formulated as problems in the court of king Arthur’s Camelot in Satyan Linus Devadoss and Matthew Harvey’s *Mage Merlin’s unsolved mathematical mysteries*.

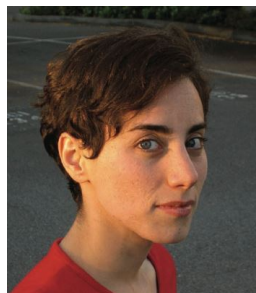
Mage Merlin’s Unsolved Mathematical Mysteries by *Satyam Linus Devadoss* and *Matthew Harvey*, MIT Press, 2020 (115 p.), isbn: 9780262044080.

In their acknowledgements the authors write “From the moment of this book’s conception, we knew that we wanted to create something unusual, something that colored outside the lines of traditional mathematics” and I confirm wholeheartedly that they succeeded well in this attempt. The title and the cover already suggest that it is some account of mages, princesses, and knights of the round table in a legendary Arthurian time frame, and indeed it is. One would not expect mathematics to be involved, and yet, the essence of the book is to present sixteen unsolved mathematical problems.



S.L. Devadoss

This is only possible because the problems have very simple formulations. The Goldbach conjecture is a typical example. The authors start their book by explaining that a typical view of mathematics is like a mountain with simple arithmetic as the wide bottom and moving up to advanced mathematics accessible for fewer and fewer people with at the “icy” top of the mountain the few unsolved problems of mathematics that are left for the mathematical mages. Their own view, of which the present book is an illustration, is the opposite. Mathematics is like an ice cream cone, with arithmetic at the pointy bottom and advanced mathematics at the broad top of the cone. The higher one moves up the cone, the more tools there are to solve problems that can be safely included in the cone, while the many open problems are represented by the delicious ice cream scoop on top. This book presents sixteen samples of these ice cream problems, waiting for a solution.



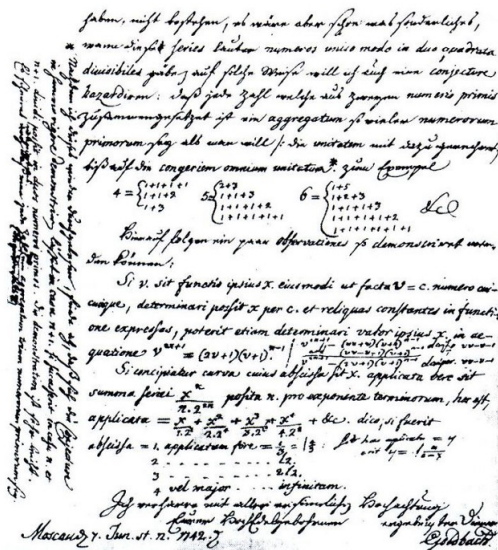
Maryam Mirzakhani

Mathematical problems, easy to formulate, but difficult to solve regularly appear in popular mathematics books and often belong to number theory, graphs, or geometry. They require the least terminology to be formulated. Since they are easy to pose, even without any reference to mathematics, the authors decided to let a fictional character Maryam, a descendent of Merlin the magician, tell us about some of the problems she finds in a book where Merlin wrote down his unsolved Camelot problems. Maryam is the character that translates Merlin’s problems formulated in non-mathematical terms, into mathematical language and adds her own comments. The authors chose the name Myriam, by which

they want to pay tribute to Maryam Mirzakhani, who is, so far, the only woman who won the Fields Medal, but who untimely passed away in 2017.

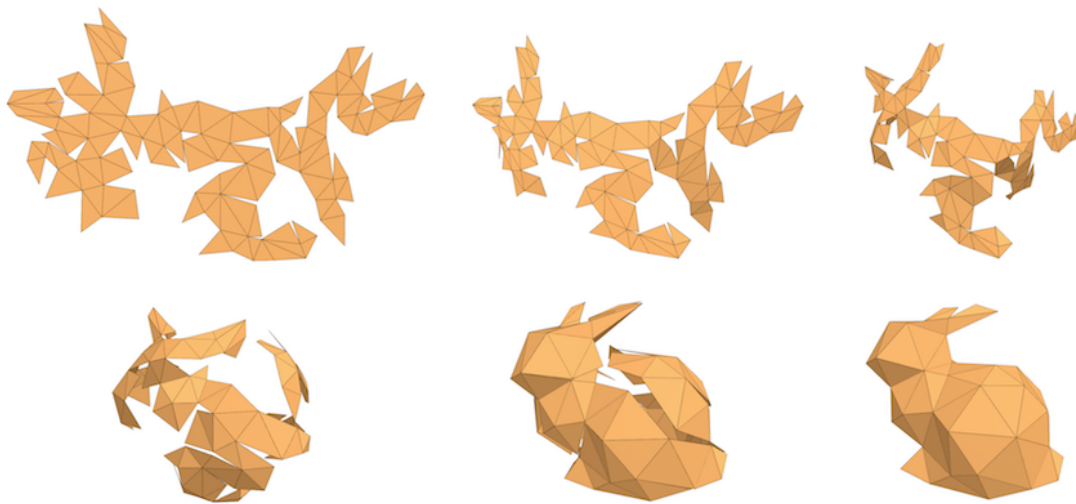
All 16 problems are all discussed in a similar way. First there is a title page with a short paragraph giving a ‘modern’ introduction to situate the problem. Then there is the story of the problem as Merlin formulated it. It is printed on a nicely illustrated double page with a coloured background, suggesting a reproduction of the parchment pages of Merlin’s book. Finally there are two more pages with Myriam’s translation into mathematical jargon and her summary of what is currently known about the solution.

The remarkable thing about the formulation of Merlin’s problems is that the mathematics are wrapped up in a story about King Arthur’s court Camelot. For example the twin prime conjecture is



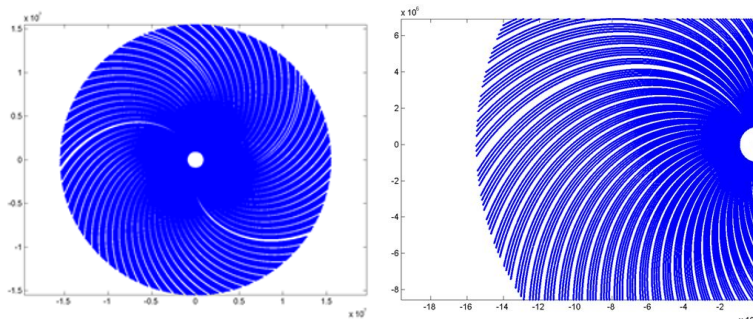
Goldbach’s letter

presented as two princesses born on the same day but two years apart. A special celebration takes place on their birthday whenever both their ages are prime. Will this go on forever? Wrapping the birthday presents is another problem that translates into mathematics as asking if every polyhedron can be unfolded in a single (connected) flat surface without overlap, and what if only cuts along the edges are allowed. Proving that there exist infinitely many perfect numbers (numbers equal to the sum of their proper divisors) is presented as a cake cutting problem. Goldbach's conjecture (every even number greater than 2, can be written as a sum of primes) is formulated as a double row of soldiers (even number) that has to split up into two groups. It should be proved that it is always possible to split them such that neither group can be arranged in rows forming a rectangle (have no divisors, i.e. the number of soldiers is prime). Problems from graph theory are formulated as design problems for a maze, a toy, or a tapestry. And similarly, non-mathematical situations are invented for all 16 puzzles.



Unfolding a polyhedron

The amazing fact is that, although all the problems remain unsolved till this day, they are explained with little or no mathematics on a single page or less. Probably not only professionals but also several amateur mathematicians, misled by the simplicity of the formulations, have spent many hours trying to solve some of these problems. Not the solution to these problems is the most important achievement that will change the world, it is the expansion of mathematics, broadening the ice cream cone, that will support more solved problems that is so much more important. Thus if the interest of young mathematicians-to-be can be aroused with booklets like this, we can only be grateful to the authors for writing it.



A bouncer:

For every prime p define a point P with polar coordinates $(r, \theta) = (p, p)$. Plot a blue dot for all these points then you get the remarkable figure on the left (with a detail on the right) for primes between 10^6 and $15 \cdot 10^6$.

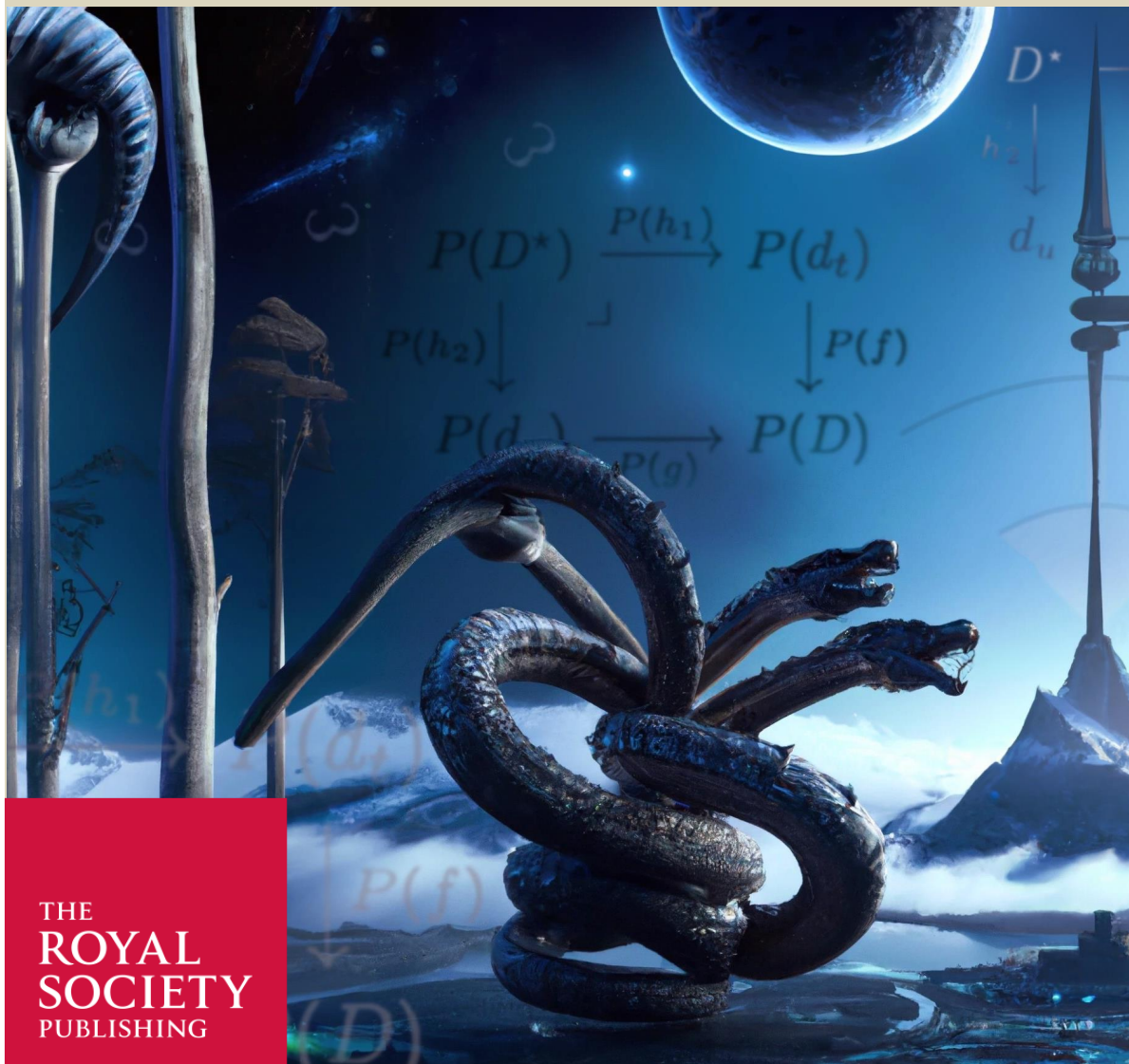
PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A

MATHEMATICAL, PHYSICAL AND ENGINEERING SCIENCES

Modern perspectives in Proof Theory

Theme issue compiled and edited by J. P. Aguilera, F. Pakhomov and A. Weiermann

Published 10 April 2023. Available online and in print.



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About this issue

Proof Theory is the branch of mathematical logic which studies the axioms of mathematics, relations between these, their limitations, and their consequences. The work of Austrian logician K. Gödel in the 1930s showed that the axioms of mathematics are not sufficient to solve all mathematical problems, and various branches of Proof Theory developed in the decades after aimed at addressing this issue. This theme issue of *Philosophical Transactions A* revisits these branches from the perspective of the status of the field in the 21st century and presents recent and current developments in them.

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Cover image:

Hydras, trees, and pullbacks. By J. P. Aguilera with the use of Dall-E 2 by OpenAI.

VII INTERNATIONAL CONFERENCE ON FINITE
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GEOMETRY AND MATHEMATICAL PHYSICS

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Application deadline for contributed talks, posters, and/or funded accommodation is **April 16th, 2023**.

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