Newsletter

BELGIAN MATHEMATICAL SOCIETY

154, September 15, 2025

Comité National de Mathématique CNM

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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By Andreas Weiermann

Contents

Foreword by the president of the BMS

Dear fellow Mathematicians,

On Tuesday, June 3, we held the second edition of our Young Scholar Day. More than one hundred participants attended the Godeaux Lecture by Ivan Nourdin and 27 talks by promising postdoctoral researchers, spread across nine parallel sessions. We warmly thank all participants, contributors, and session organizers, as well as our local organizers, François Thilmany and Jonas Deré, for ensuring the smooth running of the event.

During the Young Scholar Day, the BMS board awarded the Jacques Tits Chair 2025-26 to François Loeser (Sorbonne Université, Paris). The chair will be jointly hosted by KU Leuven (Wim Veys) and UMons (Christian Michaux). Further details about the inaugural lecture and minicourse will follow in future newsletters and on our website.

François Loeser,
2025-2026 Jacques Tits Chair

This newsletter also contains the call for the 2025 Young Scholar Award. Applications are due by October 31, and the winner will be invited to speak at our Recent Breakthroughs in Mathematics meeting on December 17, just before the New Year's break.

Looking ahead to 2026, preparations are underway for the BeNeLux Mathematical Congress, organized together with KWG (Netherlands) and SML (Luxembourg). Highlights include plenary lectures by Jessica Fintzen (Bonn), Kathlén Kohn (Stockholm), and Nathalie Wahl (Copenhagen), who will deliver the 2026 Godeaux Lecture. The program will also feature a lecture by the winner of the KWG's Brouwer Medal (to be announced), a poster session for PhD students, and parallel sessions on various topics. Let me take the opportunity that the call for session organizers remains open until September 30, with details at the end of this newsletter. We would be very happy to receive your applications, which are essential to making this event a success.

Finally, it is with great pride that I congratulate our colleague Michel Van den Bergh, who has been awarded the prestigious FWO Excellence Prize Dr. A. De Leeuw-Damry-Bourlart 2025. This remarkable honor, awarded only once every five years alongside the Prix Quinquennaux du FNRS, represents one of the highest scientific distinctions in Belgium. We warmly applaud Michel for this outstanding achievement, which reflects both his exceptional contributions to mathematics and the highest recognition of his work within the Belgian community.

We look forward to meeting you on one, or all, of our events,
Best wishes,
Joost.

1 News from the BMS & NCM

1.1 Annual meeting of the National Committee for Mathematics

Program:

14.00-14.30: Coffee and welcome; meeting of the NCM
14.30-15.30: Lecture by Jozefien D'haeseleer (UGent): Exploring finite geometry through trifferent codes, intersecting families, and spectral graph theory
15.30-15.50: Tribute to Marc de Wilde by Pierre Mathonet (ULiège)
15.50-16.50: Lecture by Ann Dooms (VUB): Can machines think?
16.50-18.00: Reception

Date: October 2, 2025, 2-6 pm

Location: Palace of the Academies.

Registration: https://bms.ulb.ac.be/conferences/2025-meeting-of-the-national-committee-for-mathematics/

Everybody is cordially invited and participation is free, but preliminary registration is mandatory.

Organizers: Françoise Bastin (ULiège) and Stefaan Caenepeel (VUB)

Abstracts:
Jozefien D'haeseleer: Exploring finite geometry through trifferent codes, intersecting families, and spectral graph theory
In this talk I will discuss three distinct but interconnected areas of research that I have investigated in recent years, all linked by the theme of finite geometry.

In the first part, we delve into Erdös-Ko-Rado (EKR) problems, a classical topic in combinatorics that explores intersection properties within mathematical structures. The foundational question concerns the maximum size of a family of k-subsets of an n-set, where every pair of subsets have at least one element in common. Erdös, Ko, and Rado proved that for $n > 2k$, the optimal construction involves subsets containing a fixed element. This result, known as the EKR theorem, extends to various other settings, including multisets, permutations, and finite geometries. In this talk, I will discuss both clas-

sical and recent results in the context of finite geometries.

The second part will be about generalized Johnson and Grassmann graphs, within the field of spectral graph theory. A central question is whether a graph is uniquely determined by its spectrum (the eigenvalues of its adjacency matrix). While many graphs are known to have this property, numerous well-known graphs possess cospectral mates (non-isomorphic graphs with identical spectra). This phenomenon appears prominently in highly symmetrical graphs, including Johnson and Grassmann graphs. Using techniques such as switching, Aida Abiad, Willem H. Haemers, Robin Simoens and I found a construction of cospectral mates for several specific generalized Johnson and Grassmann graphs.

In the final part, we make the link with coding theory, specifically trifferent codes, also known as perfect q-hash codes for $q = 3$, which has gained much attention since the 1980s because of their connections to various topics in cryptography, information theory, and computer science. Trifferent codes are ternary codes of length n with the property that for any three distinct codewords there is a coordinate where they all have distinct values. Over the finite field $\mathbb{F}_3$, Anurag Bishnoi, Dion Gijswijt, Aditya Potukuchi and I could prove that minimal codes are equivalent to linear trifferent codes, which in turn are equivalent to strong blocking sets in the corresponding projective space. Using this equivalence, we could improve the known upper and lower bounds on the size of linear trifferent codes of length n.

Ann Dooms: Can machines think?
This question was posed by Alan Turing in his seminal paper, Computing Machinery and Intelligence, laying the cornerstone for artificial intelligence. Mathematics emerged as the critical tool driving this revolution–but how? In this talk, I will unveil the mathematical foundations powering the technologies that enable machines to "think". From early theoretical concepts to cutting-edge algorithms, from classification techniques to generative AI. Let us explore how the art of mathematics pushes the limits of machine intelligence.

1.2 BeNeLux Mathematical Congress: Call for Parallel Sessions

See the call at the end of this newsletter.

1.3 BMS Young Scholar Award: Call 2025

See the call at the end of this newsletter.

1.4 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.

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- Pseudo-Carleson measures for vector-valued weighted Bergman space of the unit ball **Chunxu Xu, Changhui Wu** DOI: 10.36045/j.bbms.240719

- Existence of solution for a doubly exponential elliptic equation **Anderson de Araujo, Marcelo Montenegro** DOI: 10.36045/j.bbms.240726a
- On semi-C-reducible β-conformal change **Tahere Rajabi, Nasrin Sadeghzadeh** DOI: 10.36045/j.bbms.241006
- On bicrossed modules of Hopf algebras **Xiao Han** DOI: 10.36045/j.bbms.241113
- An application of spherical completion to finite-dimensional normed spaces **Kosuke Ishizuka** DOI: 10.36045/j.bbms.241223
- A simple oscillation criteria for second-order differential equations with piecewise constant argument of generalized type **Ricardo Torres Naranjo** DOI: 10.36045/j.bbms.250420

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- Hausdorff dimension of extremely slow minimal dynamical systems and Hölder preserving differentiable extensions **Krzysztof Chris Ciesielski, Jarosław Swaczyna** DOI: 10.
- Parallels, evolutes and certain lifts of frontal curves in the Euclidean plane **Keisuke Teramoto** DOI: 10.36045/j.bbms.240922
- Points below a parabola in affine planes of prime order **Sam Adriaensen, Zsuzsa Weiner** DOI: 10.36045/j.bbms.241203
- Characterizations of tracial functionals on matrix and operator algebras **Airat M. Bikchentaev, Mohammad Sal Moslehian** DOI: 10.36045/j.bbms.250219
- Some variants of ω-balancedness in semitopological groups **Vikesh Kumar, Brij Kishore Tyagi** DOI: 10.36045/j.bbms.250327
- Paradoxical decompositions of finite-dimensional non-Archimedean normed spaces **Kamil Orzechowski** DOI: 10.36045/j.bbms.250424
- Topological uniform descent and generalized property (ω) **Qiaoling Xin, Tianqing Cao, Yanxun Ren** DOI: 10.36045/j.bbms.250520
- A note on unbounded derivations of GB*-algebras and radii of convergence **Martin Weigt, Ioannis Zarakas** DOI: 10.36045/j.bbms.250523

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

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

2.1 September 2025

ACOMEN2025 Conference on "Advanced Computational Methods in ENgineering and Applied Mathematics"

15-19 September 2025, Gent

The ninth international conference on "Advanced COmputational Methods in ENgineering and Applied Mathematics" (ACOMEN2025) will be held at the congress center Zebrastraat in Ghent, Belgium from September 15 till September 19, 2025. The conference aims to provide an international forum to present and discuss the latest developments in computational and applied mathematics in various emerging engineering and mathematical fields.

The plenary speakers are

- Peter Bastian (Universität Heidelberg)
- Paul Bressloff (Imperial College London)
- Jerome Droniou (University of Montpellier)
- Jan S. Hesthaven (Karlsruhe Institute of Technology)
- Barbara Kaltenbacher (Alpen-Adria-Universität Klagenfurt)
- Michael Klibanov (University of North Carolina at Charlotte)
- Matti Lassas (University of Helsinki)
- Barbara Wohlmuth (Technical University of Munich)

It is a great pleasure to invite you to participate in the conference.
Website: https://analysis-pde.org/acomen2025-international-conference-on-advanced-computational-methods-in-engineering-and-applied-mathematics-conference/

Organisers:
Michael Ruzhansky, Marián Slodička, Karel Van Bockstal (local organising committee)

Cours-conference
Calculer sans calculette : comment faisait-on "avant" ?
par M. Jean-Louis MIGEOT

17 September 2025, Namur

Le Collège Belgique et Monsieur le Gouverneur de la province de Namur ont l'honneur de vous inviter au cours-conférence de Monsieur Jean-Louis MIGEOT qui se tiendra ce mercredi 17 septembre 2025 au Palais provincial de Namur.

De nombreuses générations d'élèves, de comptables, de techniciens, d'ingénieurs, et de scientifiques ont mené à bien des calculs compliqués sans les outils modernes : comment faisaient-ils ? Ce cours-conférence revisite quelques savoirs en voie de disparition : addition et multiplication par écrit, preuve par neuf, division et extraction de racines carrées à la main, utilisation des tables de logarithmes et de la règle à calcul. Le conférencier proposera un voyage nostalgique dans les classes primaires et secondaires des années soixante, mais défendra aussi l'idée que l'intimité profonde que ces moyens de calcul archaïques créaient avec les nombres constituait une base solide absolument nécessaire à la bonne maîtrise d'outils mathématiques plus avancés.

See all information on https://academieroyale.be/fr/activites-detail/dates-heures-lieux/calculer-sans-calculette-comment-faisait-on-avant-17-09-2025-17-00/

2.2 September - October 2025

VUB-Chair 2025 – Prof. Nicolás Andruskiewitsch

29 September 2025 - 24 October 2025, ULB

For the academic year 2025-2026 the VUB-chair has been awarded to Prof. Nicolás Andruskiewitsch.

Nicolás Andruskiewitsch (Conicet, Argentina) is a leading figure in the theory of Hopf algebras and quantum groups. His influential contributions have shaped the field over the past decades, with publi-

cations in top international journals and lectures at renowned conferences, including the International Congress of Mathematicians.

As part of this VUB-Leerstoel, Prof. Andruskiewitsch will deliver:

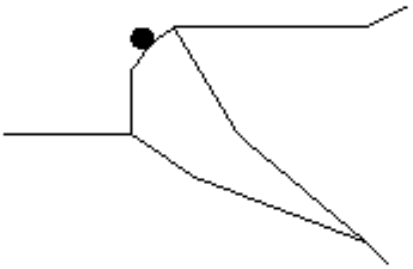
- An Inaugural Lecture on the classification of Hopf algebras on Monday September 29, 2025 at 14:00.
- A 16-hour minicourse, presenting results obtained over the past twenty years where quantum groups and Hopf algebras intersect with the theory of finite simple groups. The course will also highlight open problems and directions for future research.

Further details, including schedule and registration, are available on the course webpage:
https://leandrovendramin.org/andruskiewitsch/.

2.3 October 2025 - March 2026

Cycles de conférences ALTAÏR

11 October 2025 - 14 March 2026, ULB



Cycles de conférences ALTAÏR

Programme 2025-2026

Nous avons le plaisir de vous informer que le programme des conférences Altaïr de la nouvelle année académique est désormais consultable sur le site mis à jour https://altair.ulb.ac.be/programme-2025-2026/

Cette saison 2025-2026, nous aurons l'opportunité d'entendre et de rencontrer les personnalités suivantes:

- 11 octobre 2025 : **Ivan Nourdin** (Université du Luxembourg)
  L'intelligence artificielle décryptée : entre illusions et réalités.
- 15 novembre 2025 : **Gérard Berry** (Collège de France)
  Le temps vu autrement : perception, mesure, distribution et informatique.
- 29 novembre 2025 : **Christophe Snoeck** (VUB)
  On devient ce que l'on mange : reconstruire la vie humaine dans la préhistoire grâce à la géochimie.
- 6 décembre 2025 : **Benoit Famaey** (Strasbourg)
  Lumières récentes sur le secteur sombre de l'Univers : où en sommes-nous ?
- 7 février 2026 : **Vinciane Debaille** (ULB)
  Missions de collectes de météorites en Antarctique.
- 14 mars 2026 : **Corentin Caudron** (ULB)
  Les dangers volcaniques en Europe et en Belgique

Toutes les conférences se déroulent sur le campus de la Plaine, commencent à 10h00 et durent environ 1h30 (questions incluses). Les locaux seront communiqués dès que possible.

2.4 October 2025

Annual meeting of the National Committee for Mathematics

2 October 2025, Palace of the Academies

See all the information in 1.1 earlier in this newsletter.

Seasonal School 2025

16-24 October 2025, Gent

From October 16 to 24, 2025, we organise a school on PDEs entitled "Oscillation phenomena, PDEs, and applications: A Comprehensive School in Mathematical Analysis".

Lecturers:

- Grigori Rozenblum (Chalmers University of Technology; The University of Gothenburg, Sweden),
- Maarten de Hoop (Rice University): week 1.
- Kai Diethelm (Technische Hochschule Würzburg-Schweinfurt): week 2.
- Rico Zacher (University of Ulm): week 2.
- Enrique Zuazua (Friedrich Alexander University of Erlangen-Nürnberg): week 1.

Targeted Audience: The school is open to anyone. Please contact us by email at analysis.pde@ugent.be if you would like to participate. The school will be free of charge for UGent PhD candidates. Other participants will be charged 10 EURO per day to cover organisational expenses. Location: Campus Sterre, Krijgslaan 281, 9000 Gent, gebouw S8.

Organising and Scientific Committee: Michael Ruzhansky, Duvan Cardona, Marianna Chatzakou, Hendrik De Bie, Karel Van Bockstal.

https://analysis-pde.org/seasonal-school-2025/

2.5 December 2025

Recent breakthroughs in mathematics and general assembly

17 December 2025, Brussels

All information will be available soon on a dedicated page on the BMS website https://bms.ulb.ac.be/.

2.6 April 2026

BeNeLux Mathematical Congress

7-8 April 2026, Antwerp

The BMS, KWG and SML join forces to organise the next BeNeLux Mathematical Congress. All information will be available on https://bms.ulb.ac.be/conferences/bms-kwg-sml-joint-meeting/.

2.7 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

SLAAG !

The next session of *Slaag!*, the Séminaire de Logique, Algèbre, Arithmétique et Géométrie, will take place in Mons, on November 14, 13h30, see https://web.umons.ac.be/mapa/slaag.

- Frodo Moonen (KULeuven) : Grothendieck Rings of Ordered Subgroups of the Rationals
- Giovanni Bosco (UMons) : TBA

Organization: Quentin Brouette, Christian Michaux and Maja Volkov. If you would like to join the mailing list, please write to quentin.brouette@umons.ac.be.

Seminar on Quantum groups, Hopf algebras and monoidal categories

Organized by Joost Vercruysse (ULB), Kenny De Commer (VUB) or Pedro Vaz (UCL).
Next edition will take place on September 30 and is a special one to celebrate the (49th and) 50th seminar. On this occasion, we will have lectures by Kevin Coulembier, Robert Laugwitz, Ehud Meir and Christoph Schweigert. For more information, also on future seminars, we refer to our website: https://hopfalgb.ulb.be.

Ghent Geometric Analysis Seminar

https://analysis-pde.org/seminars/ghent-on-geometric-analysis/

Ghent Methusalem Junior Seminar

https://analysis-pde.org/ghent-methusalem-junior-seminar/

Seminar of Analysis and PDE

https://analysis-pde.org/seminars/

Ghent Methusalem Colloquium

https://analysis-pde.org/ghent-methusalem-colloquium/

3 PhD theses

Partial modules and comodules of Hopf algebras

William Hautekiet
ULB
18 April 2025, ULB

Thesis advisors: Prof. Dr. Joost Vercruysse (ULB) and Prof. Dr. Paolo Saracco (Sevilla)

Summary:

The introduction of partial actions of groups by Exel in 1994 was the start of many exciting developments in the theories of C^*-algebras and dynamical systems as well as representation theory. A partial action is obtained by restricting the action of a group on a set to an arbitrary subset. Dokuchaev, Exel and Piccione started a purely algebraic treatment by introducing partial representations – a linearized version of partial actions – in 2000. These notions were generalized further to partial actions and partial representations (or partial modules) or Hopf algebras from 2009 on.

Partial modules of a Hopf algebra H satisfy axioms that are a weakening of the usual mixed associativity axiom for modules. They correspond to modules of a suitably constructed Hopf algebroid H_{par}. Partial comodules are defined dually to partial modules and provide a generalization of graded vector spaces and algebras.

An interesting feature of partial representations is that they are not only based on the algebraic properties of the Hopf algebra, but also on the coalgebraic properties. This indicates that studying partial representations can probe deeper in the structure of a Hopf algebra. However, it is generally difficult to explicitly describe the partial "Hopf" algebra H_{par} and its (simple) modules for a given Hopf algebra H. Also the semisimplicity of H_{par} remains an open problem.

The first aim of this work is therefore to develop techniques for constructing partial modules and partial comodules of large classes of Hopf algebras, for instance connected, cocommutative and semisimple Hopf algebras. The second goal of this dissertation is to study properties of the *categories* of partial modules and partial comodules of Hopf algebras as a whole.

This thesis is divided in three parts. In the first part, partial representations of groups that are global on a large subgroup are studied. They are equivalent to representations of a certain groupoid algebra. This approach allows to obtain explicit formulas describing the irreducible objects, something which is not feasible in the general case since the number of simple partial modules grows rapidly with size of the group.

Part II is devoted to partial modules of Hopf algebras. In Chapter 2, we first show that any partial representation that is multiplicative on the coradical is in fact global. In particular, connected Hopf algebras do not possess partial representations that are not global. This result shows that partial representations encode information on both the algebra and coalgebra structure of the Hopf algebra, in contrast to the global case. We further study partial representations of Hopf algebras that have the form of a smash product, permitting to describe the partial "Hopf" algebra of cocommutative Hopf algebras. In Chapter 3, we consider a natural action of the category of global modules on the category of partial modules, making the latter a biactegory (also called bimodule category). Objects in the center of this biactegory are called partial Yetter-Drinfeld modules. We show that the partial smash product of a commutative partial Yetter-Drinfeld algebra with the Hopf algebra H is a Hopf algebroid, extending a theorem by Brzeziński and Militaru. It turns out that the globalization of partial modules is closely related to the actegory structure. This leads to the construction of a new Hopf algebroid H_{glob}.

Partial comodules are treated in Part III. A general construction for partial comodules of Hopf algebras is given in Chapter 4, using central idempotents of right coideal subalgebras, which we call *subcentral idempotents*. Our construction obtains every 1-dimensional partial comodule, and in case H is a finite group algebra, we have good control over the simplicity and redundancy of the constructed partial comodules. We see these results as a first step towards the classification of simple partial modules and comodules. In the final chapter of this thesis, it is proved that the category of partial comodules is comonadic over vector spaces. This implies that it can be seen as the category of comodules of a certain comonad. The explicit construction makes use of topological vector spaces and topological cofree coalgebras.

The Many Faces of Strategy Complexity

James C. A. Main
F.R.S.-FNRS & UMONS

23 September 2025, 4:00, University of Mons, on the Plaine de Nimy Campus, Vésale Building, La Fontaine Room

Thesis advisor: Prof. Dr. Mickael Randour (F.R.S.-FNRS & UMONS)

Summary:

A *reactive system* is a system that continuously interacts with its (uncontrollable) environment. Controllers for reactive systems are notoriously difficult to design, due to the possibly infinite behaviours that the environment may exhibit. This motivates the need for approaches to *automatically design* controllers. *Reactive synthesis* allows one to obtain a correct-by-construction controller automatically from a formal specification. The synthesis problem can be solved by means of a *game-theoretic approach*: we model the interaction of the system and the environment as a game and compute well-performing strategies of the system in this game. A *strategy* of the system player in such a game is the formal counterpart of a *controller* of the system.

A central question is to understand *how complex* strategies must be to enforce specifications. A classical representation of a strategy is via a *Mealy machine*, i.e., a finite automaton with outputs along its transitions. This model is used to define a classical measure of strategy complexity: the size of the smallest Mealy machine inducing it. This is known as the *memory* of the strategy. We explore *different visions* of strategy complexity: starting from this classical model, moving on to randomisation and finally to alternative representations.

First, we consider strategy complexity in the *memory framework* in multi-player turn-based games played on deterministic graphs. We consider multi-player games with (variants of) *reachability* objectives, and focus on *Nash equilibria*, a classical solution concept in multi-player games. We study the sufficient amount of memory to design Nash equilibria in which a given set of players win. We obtain that the memory needed in games with reachability objectives for such Nash equilibria depends only on the number of players, and that finite memory suffices if all players aim to visit their targets infinitely often rather than only once.

Second, we consider *randomisation* in strategies. Randomisation is useful to balance different goals or to hide one's intentions from others. Randomisation in strategies can be integrated into decision making in different ways. With *mixed strategies*, one tosses a coin at the start of a play to select a deterministic strategy (possibly among infinitely many), and follows this strategy for the entire play. With *behavioural strategies*, one tosses a coin at each step to select an action. Kuhn's theorem, a seminal result in game theory, asserts the equivalence of these two models of randomisation in a broad class of games, called games with perfect recall. We investigate an *analogue of Kuhn's theorem* for finite-memory strategies: we classify the different variants of randomised strategies based on stochastic Mealy machines with respect to their expressiveness and obtain a hierarchy of randomised finite-memory strategies.

As all models of randomisation do not share the same expressiveness, it yields *another measure of strategy complexity*. This measure is not directly related to memory requirements: there can be a trade-off between memory and randomisation requirements in general. We thus investigate *randomisation requirements* in a setting in which randomisation is required: *Markov decision processes* (MDPs) *with multiple objectives*. A Markov decision process is a one-player game where the environment is fully stochastic. Each strategy in an MDP with multiple objectives yields a vector of expected payoffs: we investigate the structure of the set of such expectation vectors under all strategies. We obtain that in

this setting, under wide-ranging assumptions, a *limited form of randomisation suffices*.

Finally, we study an *alternative representation* of strategies in a class of infinite-state MDPs. We study *one-counter MDPs*: finite MDPs augmented with a counter that can be decremented, incremented, or left unchanged on each transition. In this setting, strategies with no memory need not admit a finite representation. We consider a natural class of counter-based strategies that admit *finite representations* based on partitions of counter values into *intervals*. For two reachability-based objectives, we provide polynomial space algorithms to solve the problem of checking whether a strategy enforces the objective with high enough probability and to solve the problem of determining whether there exists a well-performing strategy whose representation satisfies constraints either its structure.

Our results highlight the *multi-dimensional nature* of strategy complexity. We explore several of these dimensions with the goal to provide building blocks for an extensive framework of strategy complexity.

4 Job announcements

4.1 From Western Norway University of Applied Sciences

Two open PhD positions (in Bergen) from the project "Physics-Adapted Numerical Methods for Two-Phase Flow".

Details: https://www.jobbnorge.no/en/available-jobs/job/286180/1-2-phd-research-fellows-in-numerical-mathematics-for-two-phase-flow

Deadline: 15/10.

5 News from the universities and other societies

5.1 FWO excellentieprijs dr. A. De Leeuw-Damry-Bourlart 2025

Michel Van den Bergh receives the FWO excellentieprijs dr. A. De Leeuw-Damry-Bourlart 2025, https://www.fwo.be/nl/resultaten-outreach/nieuwe-wetenschappelijke-inzichten/laureaten-fwo-excellentieprijzen-zijn-bekend/.

The award ceremony takes place 24 November in BOZAR: https://fwo.idloom.events/uitreiking-excellentieprijzen-2025.

Congratulations!!

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

6.1 Collector's item: postal stamps with π theme

In its postage stamp collection of 2025 the Belgian Post wants to honor Belgium and its creative spirit, between history and innovation. Next to Pink ribbon stamps, Smurf stamps and stamps for the 600

years of the KU Leuven & UCLouvain, there is also a set of 5 round stamps with the number π as a theme. One of them also features Albert Einstein who was born on π-day 1879.

Get your set of stamps from https://eshop.bpost.be/nl/products/do-you-pi-postzegels-wereld.

6.2 Math contest: True 4D and 3D visualisations of complex functions

The contest founder developed a method to represent complex valued functions $w = f(z)$ as "true four-dimensional surfaces" while using all 4 dimensions (as opposed to common methods that retain only two or three dimensions, possibly colour-coded for the fourth. Think of the Tesseract though, routinely 4D-pictured!).

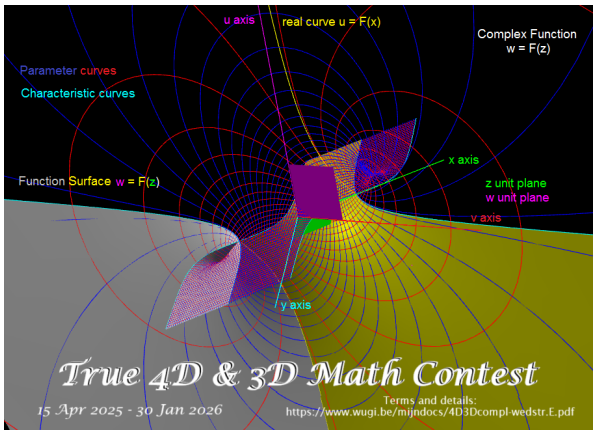
There exist also "true 3D curves": spatial or sometimes planar curves that are "integral parts" of the 4D function surface, obtained by keeping one of the four coordinates constant. And 3D surfaces of true curves, generated by treating the fourth coordinate as a parameter.

'Mainstream' sources (literature, courses, youtube channels, maths tools and so on), dedicated to complex valued functions and their graphical rendering, while featuring great 3D and 2D methods, just seem to ignore the methods mentioned here. This math contest aims to reward the one who best contributes to remedying this state of affairs, by producing the following output:

1. An "app" offering these "true 4D and 3D" visuals, besides the "traditional" complex function visuals;
2. A "Demo" of this app;
3. A Wikipedia page on this method, app and demo;
4. A publication of these in a scientific journal.

For details on the methods presented here, please download the paper
https://www.wugi.be/mijndocs/compl-func-visu.4D3D.pdf with all the necessary links in the references there, to websites and Youtube channels with examples.

For details on the contest, see this document:
https://www.wugi.be/mijndocs/4D3Dcompl-wedstr.E.pdf
(or https://www.wugi.be/mijndocs/4D3Dcompl-wedstr.NL.pdf).

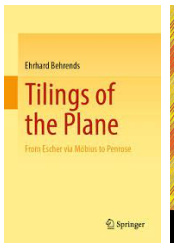


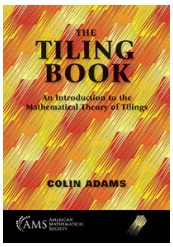
6.3 Mathfest 2025

6.4 Adhemar's corner

Enjoy reviews by Adhmear on two books about tilings of the plane. The first book is by E. Behrends, *Tilings of the plane: Form Escher over Möbius to Penrose* and the second by C. Adams, *The tilings book*.

Tilings of the plane. From Escher via Möbius to Penrose Ehrhard Berendt. Springer Nature, 2022 (294 p.), isbn: 978-3-030-42652-1.
The tiling book Colin Adams, AMS/MAA, 2022 (298 p.), isbn 978-1-4704-6897-2



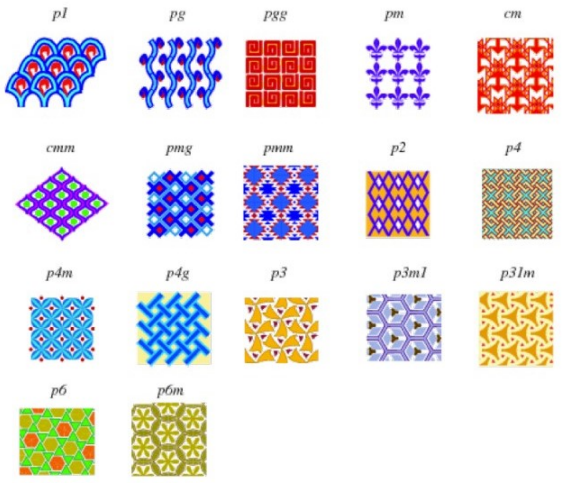



Ehrhard Behrends

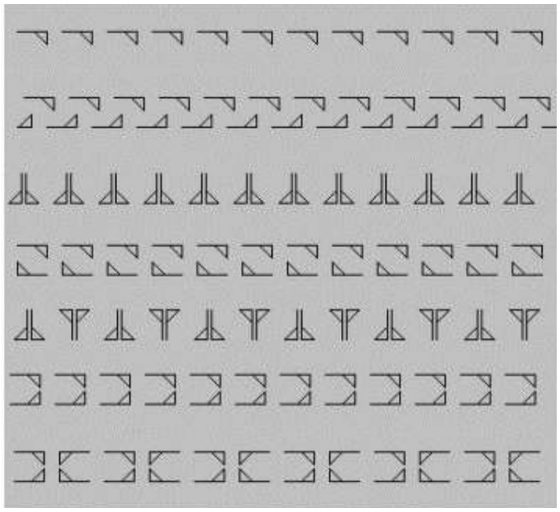
Colin Adams

These are two marvelous books on tilings. The subject is very visual so that you see in the layout of the tessellations what you have to prove, and conversely when you have some symmetry rules for the tiles and or for the whole tiling, then trying to satisfy these rules leads to a number of different solutions that may not have been obvious when you formulated the rules. A genuine mathematician will then try to list all the possible tilings that satisfy these conditions. Of course the random tilings are not very interesting, it are imposed symmetries that give the nice results and that are naturally conceived as pleasing to look at. Symmetries of course means mathematically that there are groups involved. But in general the mathematics are rather simple. However, there are still some open problems that are easy to formulate, yet still unsolved for the moment.

The authors of these books are taking their own approach to the subject. Behrends starts with a general setting where each point in $\mathbb{R}^2$ is associated with a colour. All kind of transformations can be applied which can be settled down to a group of symmetries (translations, rotations, reflections, glide reflections) such that the colored plane before and after the transformation looks the same. The groups need to be discrete and must have a fundamental domain, i.e., a *single tile* which, by applying all the transformations, will tile the whole plane. There are some natural restrictions to make this happen and by investigating all the possibilities it leads to the 7 frieze groups (only 1 direction of translation) and the 17 wallpaper or crystallographic groups (2 independent translations).



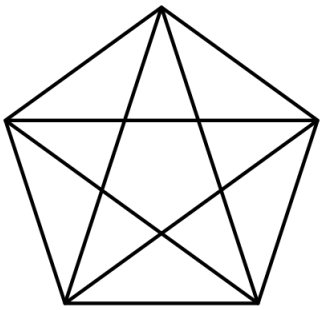
Wallpaper groups ©wolfram mathworld

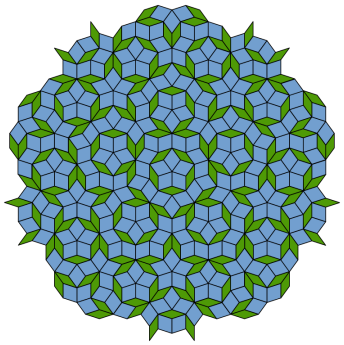

Frieze groups

Each of them is investigated in detail. The translations define the lattice where the tiles have to be placed after the transformation. However to make sure that they really cover the plane without overlap, the tiles have to be designed in an appropriate way. How to do that is described by Heinrich Heersch (1906-1995). At every vertex of the grid, the angles of the tiles meeting there should add up to 2π. That implies that it is impossible to obtain a tiling with only n-gons if

$n \geq 7$. Depending on the number and type of n-gons that share the different vertices of a tile, the tile can be designed. The straight edges of the n-gon tile can be replaced by curves that are such that they can match with edges of itself or of the other tiles. Each of the 28 Heersch constructions is discussed in detail.

Then there is a slight shift of topic. The second part of the book is devoted to Möbius transforms $z \to \frac{az+b}{cz+d}$, $ac - bd \neq 0$, with normalization $ad - bc = 1$. These are holomorphic 1-1 mappings of the Riemann sphere $\hat{\mathbb{C}}$ leaving circles invariant (straight lines are degenerate circles with center at infinity). These transforms also form a group. Aside from the identity, a Möbius transform can be parabolic (a translation), hyperbolic (a dilation), elliptic (a rotation), or loxodromic (a scaled rotation). A repeated application of these give transforms that can be considered as a dynamical system for which the orbits can accumulate in fixed points, that are attractors or repellors. Of course the discrete subgroups (Kleinian groups) are the ones that are interesting for tiling. Also here one has to define a fundamental domain (a basic tile). The most classical Möbius transforms are the ones that leave either the upper half plane or the unit circle invariant. Here the modular group $SL(2,\mathbb{Z})$, generated by $z \mapsto -1/z$ and $z \mapsto z+1$ results in a tiling of the upper half plane, and using a Cayley transform thus also of the unit circle. Both are typical representations of hyperbolic geometry and it is only in this geometry that the transformed tiles keep shape and size. But other groups like the Schottky group generated by a transforms that are defined by how they map the outside of a given circle onto the inside of another one. Investigating the limit circles of the dynamical system (circles are mapped into smaller circles inside previous circles) giving eventually fractal curves of fixed points (like Julia sets).





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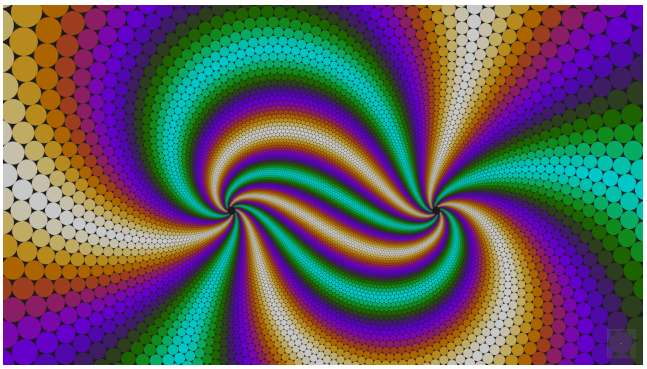
R. Penrose in Texas A&M University

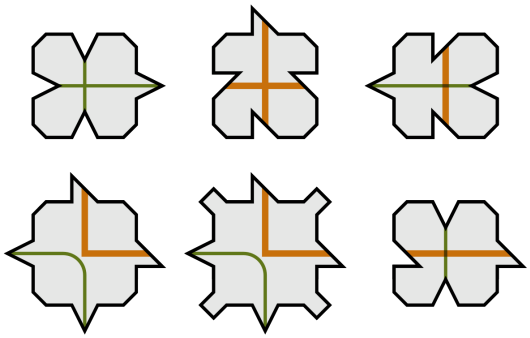
There is a third part that is devoted to nonperiodic (Penrose) tiling. That is when there is no translation that can map the tiling onto itself. The simplest example has 2 basic tiles which are the 2 types of isosceles triangles between the outer and the inner pentagon when a pentagram is drawn in a regular pentagon. On condition that these are arranged following some rules, they will form a Penrose tiling of the plane. An example is shown in the figure where 2 triangles with an acute top (green) and 2 triangles with obtuse top (blue) are glued at their base and the plane is tiled with these lozenges. The Robinson tiles are singles tiles that allow aperiodic tiling. An *einstein* (2023) is a single prototile that only allows aperiodic tilings.

Colin Adams takes a slightly different approach. He starts form the protoset, which is the set of basic tiles that are then transformed (translate, rotate, reflect, glide reflect) to tile the plane. Tilings are investigated by classifying the transitivity classes of tiles (the orbits of the tiles in the protoset). Unlike in Behrends' book the tiles can be much 'wilder', they are not simple modifications of the edges of a (generally convex) polygon. Tiles can be convex or not, tilings can be edge-to-edge or not, regular or semiregular, uniform, periodic, etc. All this results in

different classifications. There are for exampe 11 Laves, 7 Frieze, and 17 wallpaper tilings. A tile can be surrounded by transforms of itself to form patches, which van be used in turn to fill up the plane. Theorems can be proved about all these settings and for example find formulas for an average number of edges or vertices per tile. Of course there are the aperiodic tilings too. Here Adams introduces different methods to generate the aperiodic results. There are for example reptiles, which is recursively filling up a tile with scaled replicas of itself or with scaled tiles from a protoset. Blowing up everything means that these can fill the whole plane. Other examples are the single Robinson tiles, protosets obtained via projection from a higher dimensional lattice, and the Taylor-Socolar hexagonal tiles, which all result in aperiodic tilings.



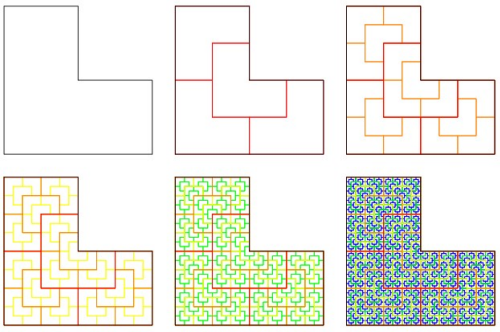
Loxodromic spiral ©wikimedia commons



Robinson tiles ©futility closet

The last chapter deals with tilings in other geometries and other dimensions. Cyclic tilings can best be represented on a cylinder or a torus, but here it concerns tilings of the sphere, the hyperbolic plane (here represented in the disk), or the 3D Euclidean space, and putting in some topology, there can be knotted tilings, jumping to a more advanced level.

Both books contain theorems and proofs and are amply and beautifully illustrated. Definitions, propositions and theorems are highlighted. The Behrends book has a standard format, while the Adams book has larger format and might suggest a (definitely wrong) impression of a picture book. The approach of Behrends is one of a (student) mathematician who wants to learn about the subject, and the part on Möbius transforms is perhaps more addressing a mathematically minded community. The Adams book on the other hand seems to be more addressing the hobbyist who is intrigued by pictures and wants to learn the mathematics behind them, which turns out to be in some aspects more advanced than Behrends. Adams adds a lot of exercises at the end of sections. No solutions are provided. To some extent, his approach is more heuristic. For example the protoset is the starting point, while Behrends finds a single fundamental set only after the required symmetry properties of the tilings are explained. Adams also includes many 'projects' which require more exploration than just solving an exercise. There are some 'open problems', questions that are still open and that need further research. I would have hoped for more discussion about available software to let the reader experiment with. It exists but is not discussed in these books.



L-shaped rep-tile ©Wolfram.com

There are some typos in Behrends's book: The tiling of the Heersch construction 12 seems to be wrong (p.124), circles with centers m_1 and m_2 and radii r_1, r_2 are disjunct if $|m_1 - m_2| > r_1 + r_2$, not $|z_1 - z_2| > r_1 + r_2$ (p. 206), and 'canstant' should be 'constant' (p.177). But let that not hold you back from reading (and studying) these marvelous books.

Adhemar Bultheel

BeNeLux Mathematical Congress: Call for Parallel Sessions

To all members of the KWG, the BMS, and the SML,

On 7–8 April 2026, our three societies will jointly organize the "BeNeLux Mathematical Congress" featuring four plenary talks, a poster session, and several parallel sessions on specialized topics. Each parallel session will last 90 minutes and consist of three short talks of 25 minutes each, followed by 5 minutes for questions and transitions.

We are now inviting proposals for parallel sessions. The deadline for submitting proposals is **September 30, 2025**. Submissions can be done by sending them to the email address bms@ulb.be. A proposal should include:

- A title and a brief description (up to 10 lines) of the session's topic, explaining the timeliness and interest for the members of our societies.
- The names of at least two organizers (who may be from the same or different societies).
- A preliminary list of potential speakers (a final list is not required at this stage).

The scientific committee will select the parallel sessions, ensuring a diverse range of topics and a balanced representation of organizers from the three societies. If multiple proposals on the same or closely related topics are submitted, the committee may suggest merging them.

Once a session is selected, its organizers will be responsible for inviting speakers. While we are unable to provide financial support for invited speakers, we encourage organizers to seek external funding if necessary. However, session organizers and speakers will be granted free attendance at the BeNeLux Mathematical Congress. We strongly encourage organizers to take into account various aspects of diversity (gender, minority groups, career level) when selecting co-organisers and speakers for a session.

We look forward to your proposals and to a stimulating joint meeting.

More information about the meeting can be found at the following address:

https://bms.ulb.ac.be/bms-kwg-sml-joint-meeting/

BMS Young Scholar Award: Call 2025

The BMS Young Scholar Award is a yearly prize established by the BMS board in 2021 to commemorate the centenary of our society. This document concerns the 2025 call for the award. The rules of the prize are as follows:

- Each year, the BMS board decides on the calendar of the prize. For 2025 the calendar is as follows:
  - Call will be launched in September ‘25
  - Call closes October 31, ‘25
  - Decision made and announced by the BMS board in November ‘25.
- Eligibility criteria
  - Candidates must hold a PhD in any area of mathematics (in a broad sense) for less than 7 years (in practice for the 2025 call, this means that the PhD should be defended not earlier than 2019). The board can decide to extend this period in case of particular circumstances (childbirth, career break, medical leaves, etc.).
  - Candidates must have strong link with Belgium. Such a link might, for example, be demonstrated in the following way:
    - The candidate obtained his/her PhD from a Belgian university (a double degree is allowed as well)
    - The candidate is working or has worked recently at a Belgian university.
- The decision on the winner is made by the board of the BMS. The sole selection criterium is scientific excellence. The board of the BMS does not need to communicate the reasons for its decision. The outcome can not be disputed.
- The BMS has the right not to award the prize if there are no eligible candidates and/or if the BMS board considers that the eligible candidates do not reach the standards to be awarded with the prize.
- Candidates can be nominated by a head of department, or a head of a research group from a Belgian University, or by a member of the BMS board. This person is

called the “promotor” of the candidate hereafter. Each promotor can nominate at most one candidate.

- In order to nominate a candidate, the promotor should send the following documents to the email address bms@ulb.be.
  - A (short) CV of the candidate, including a full publication list, previous positions, grants and awards and including contact information of the candidate.
  - A (short) support letter of the promotor, highlighting the merits of the candidate.

These documents should arrive at the above email address before the deadline of the call defined in the calendar of the relevant year.

- Board members cannot propose themselves for the prize. However, it can be the case that board members are eligible for the prize, and proposed by others. In this case they will not be taking part in the voting process, and are excluded from all further discussions.
- The prize cannot be won twice.
- The winner of the prize will receive a one year honorary BMS membership and will be invited to give a plenary talk during a BMS event organized within one year following the decision of the board. During this event, the winner will also receive a diploma and a prize of 500 euro. The name of winner of the prize will be published on the BMS website.