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Event Nederlands Mathematisch Congres (NMC 2024)

A great moment to be part of Dutch mathematics

The NMC 2024 was held on the 2nd and 3rd of April in the conference centre De Werelt, in Lunteren. The organizers were present from Monday evening to welcome the invited keynote speakers and ensure everything was set up properly. Mails were sent until late evening to gather all the slides and the material for the wonderful sessions. More than 200 participants registered for the NMC, a sign that the current setup appeals to the community.

The alarm clocks went off early on Tuesday, and mathematicians from all corners of the country had to take early trains to be there on time. At De Werelt the tables of KWG, PWN, Vierkant voor Wiskunde, NETWORKS and Epsilon, were carefully prepared and covered with books, magazines and flyers for the visitors to come. Around 9:00 people started arriving in Lunteren. Those who didn't know exactly where the conference centre was, only had to spot the other mathematicians and follow them through the forest to De Werelt. The weather was perfect for a spring morning walk. Hearing the chatting at the entrance to the conference centre, it was clear that this was going to be a very nice two-day event. Mathematicians from all generations, from master students to emeriti professors, were present to share their experiences and learn what had happened in the world of Dutch mathematics during the previous year.

Plenary lecture: Complexity and partition functions sign the start

The first keynote speaker of the day was Professor Leslie Ann Goldberg, from the University of Oxford. From the first second you felt the energy of the speaker, her enthusiasm, and the captivating introduction to the topic gave an amazing momentum to the first day.

Leslie's academic interest is in the mathematical foundations of Computer Science, where the goal is to quantify the inherent complexity of computational problems, and the quality of approximation algorithms (giving rigorous proofs about what is possible in terms of computation).

Leslie focuses especially on the role of randomness in computation, and in her talk she gave a survey on the complexity of approximate counting. This is a research area that lies at the intersection of theoretical computer science, combinatorics and probability theory. The focus of the talk was partition functions, an object of crucial importance in statistical physics and combinatorics.



Professor Leslie Ann Goldberg

Highlight of the talk – Dichotomy theory

Every partition function with mixed signs is either computable in polynomial time or #P-complete.

It was also very nice to hear about some recent breakthroughs of Dutch origin in this area. Mathematicians Viresh Patel (Queen Mary, University of London), Guus Regts and Han Peters (both at UvA) proved key results, which show how to approximate certain real-valued partition functions by bootstrapping zero-free regions of these functions in the complex plane [2, 3].

Young KWG: Embracing generative AI (by Sven Polak and Bharti)

Young KWG organized a panel discussion about ‘Generative AI in Mathematics Research, Industry and Teaching’. The panel consisted of three young mathematicians: Stefan Buijsman (TU Delft), Antske Fokkens (VU) and Wouter Kool (from the optimization company ORTEC). The session sparked an interesting debate about whether generative AI will be helpful for proving theorems and writing research papers soon. It also shed light on the use of generative AI in teaching: must students use it? Several decades ago, when calculators became widely available, people argued against the use of them in high schools. However, calculators are now widely used in schools. In general, it is best to work with new developments (and provide rules about their use), instead of forbidding them. People kept discussing it over lunch, it was an inspiring session!

EWM-NL, clusters and poster session

Spread over the day you could also participate in panel discussions, presentations from the clusters, and a poster session. The EWM-NL session consisted of a panel discussion with the invited speakers of the congress. The discussion revolved around questions about inclusivity and identity, for example: “How do you think about gender representation in your work, be it in articles, conferences or in the classroom?”

During the poster session you could have a look at various research topics. The session was very successful with many wonderful posters. PhD students Jens de Vries and Alexander Wierzba from Twente, and both under the supervision of Felix Schwenninger, received the 1st and 3rd prizes for their posters entitled: ‘A unifying approach to von Neumann’s inequality and Crouzeix’s



Wouter Kool (ORTEC), Stefan Buijsman (TU Delft) and Antske Fokkens (VU Amsterdam) participated in the Young KWG panel.



The three KWG Poster Prize winners



The Pythagoras Profile Essay Prize winners

conjecture’ and ‘BIBO stability of infinite-dimensional systems’. Agnieszka Janicka from the TU/e and NETWORKS received the 2nd prize. Her poster highlighted recent work on scale-free cascading failures in flow networks.

The future looks bright: Stieltjes and Pythagoras prize

The jury for the Stieltjes Prize decided to award the Stieltjes Prize to Lucas Slot (CWI and Tilburg University) for his thesis entitled *Asymptotic Analysis of Semidefinite Bounds for Polynomial Optimization and Independent Sets in Geometric Hypergraphs*.

Furthermore, on 3 April, the final of the Pythagoras Profile Essay Prize took place! This year there was a decrease in the number of entries, in total nine papers were submitted. However, there was a wide variety of subjects. The jury, consisting of Enno Diekema, Klaas Pieter Hart, Geertje Hek, Relinde Jurrius and Niels Kolenbrander, determined the winners in three steps after a first reading of the papers. Tjeerd Duursma and Stijn Meershoek from the Alfrink College in Zoetermeer, and Eva Jiang and Alex Hereijgers from the Stedelijk Gymnasium Nijmegen, were invited to give a presentation at the NMC. Both presentations were very good and the jury decided to award a shared first place [1].

Beeger lecture: The fine art of point counting

The great energy of the morning session stayed high also during the afternoon sessions. It was almost time for the second keynote



A very inspiring talk by Andrew Sutherland

speaker. Attending a talk on number theory is something you are always looking forward to as a mathematician, even if you are not working in this field. Actually it is something everyone should be looking forward to! This enthusiasm may be diminished if the first words of a speaker are about sheaves, zeta-functions, varieties, and other wild constructions of modern number theory. But Professor Andrew Sutherland, from the mathematics department at the Massachusetts Institute of Technology (MIT), made it perfectly clear why it is so cool to be working in modern number theory!

Some of the most fundamental questions in number theory can be reduced to a problem of ‘counting points’ on some arithmetic object: this includes questions involving Diophantine equations (Hilbert’s 10th problem), zeta functions (the Weil conjectures), algebraic varieties (the BSD and Sato–Tate conjectures), and L -functions (modularity and the Langlands program), as well as many problems in the burgeoning field of arithmetic statistics.

The *Indagationes Mathematicae* Best Paper Award

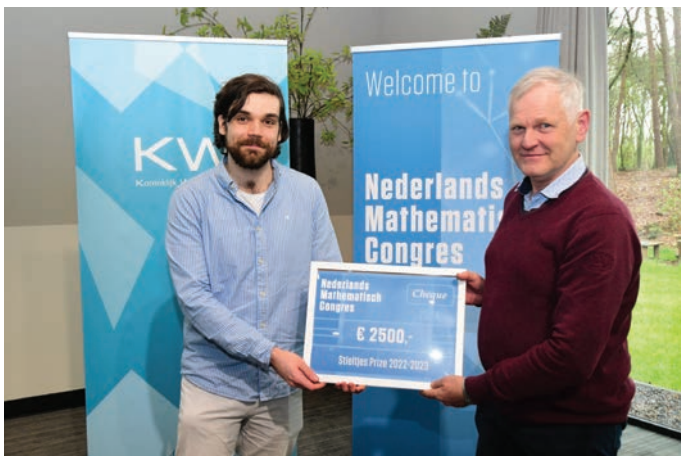
In 2023, the Royal Dutch Mathematical Society (KWG) and Elsevier introduced an award for the best paper of the journal *Indagationes Mathematicae* (IM), published by Elsevier under the auspices of KWG. This year the IM Best Paper Award was awarded to Gautam Chinta, Nathan Kaplan and Shaked Koplewitz for their article ‘The cotype zeta function of \mathbb{Z}^d ’.

Speed dating with companies (by Bharti, Young KWG and UvA)

“I had the privilege of attending NMC, where I had the opportunity to converse with some incredibly bright minds who not only hail from academia but also thrive in industry. The speed dating session was impressively orchestrated, guiding me through insightful encounters with professionals from various fields. My journey commenced with CQM, where Dr. Joost van Sambeek elucidated the consultant’s role: problem-solving through modeling and continuous client collaboration. He discussed the main problem for which they provide consultancy, i.e. warehousing, logistics and R&D. I further discussed the second area as it has my interest. Dr. Sambeek also shared a recent warehousing problem they consulted on (organising the storage of trolleys). After this I met with NS and discussed a number of problems including scheduling the frequency of trains according to the days and peak hours, or adding extra wagons to the trains according to the needs at each moment. Overall it was a very inspiring session explaining how mathematics and industry are connected!”

General assembly: updates and what’s cooking

During this session Mathisca de Gunst, chair of KWG, gave an update regarding new events and initiatives. First of all, next year will be the 60th NMC and there are plans for a BeNeLux meeting in 2026. Moreover, Teun Koetsier was awarded an honorary member-



Lucas Slot receiving the Stieltjes Prize for his research



Gunther Cornelissen and the IM Best Paper Award winner Shaked Koplewitz

ship of the KWG because of his many years of dedication to the KWG and the Dutch Mathematics Community! Last but not least, Eric Cator will succeed Barry Koren as Vice-Chairman as of 1 August and after the NMC 2025 he will succeed Mathisca de Gunst as chairman of the KWG. Niels Kolenbrander succeeded Michael Mueger on 1 November 2023 and holds the Publications portfolio. As of 2 April 2024, Charlene Kalle will be secretary, Jop Briët will be vice-secretary, Thomas Rot will be treasurer and Alef Sterk will be vice-treasurer.

NWO: Research Funding in the Netherlands

In the early morning hour of 9:00, the NWO Research Funding workshop was attended by seven PhD students. A general overview of the funding application procedure at NWO was presented, along with some tips-and-tricks to keep in mind for applications. Special attention was given to three funding instruments targeting young researchers: (1) the Rubicon grant, which can fund up to two years of research abroad at any academic institution; (2) the Veni fellowship, which funds young researchers for a three-year postdoctoral position in the Netherlands; and (3) the XS grant, which is a small grant intended to fund promising ideas and to facilitate innovative and more speculative research initiatives, and which is assessed by the applicants themselves.

Workshop Wiki edit-a-thon

During the wiki edit-a-thon at NMC on 3 April 2024 participants contributed into making female mathematicians more visible in society! At the start of 2021, EWM-NL initiated a project to add, extend, and translate pages of (mostly) women mathematicians. The project was proposed by Valentijn Karemaker and was run for two years as an EWM-NL initiative by Anne-Men Huijzer (2021) and Maria Vlasiou (2022) with the contribution of several volunteers and Wikipedia editors. From 2023 on, the project continues independently and is managed by Hester Breman. Thanks to this project Wikipedia has been enriched with many biographies of (women) mathematicians.

Plenary lecture: Graph structures and machine learning

Stefanie Jegelka (Massachusetts Institute of Technology) gave a keynote lecture on machine learning with symmetries. She ex-



Master students Yilin Li and Stijn Maatje (UvA) and Marcelo Geurts Galdámez (UU) participated in the workshop Wiki edit-a-thon.



Teun Koetsier received his honorary membership from the KWG

plained how deep learning models on graphs can be improved by using the information of Laplacian eigenvectors of the graph. However, the objects of study then come with intrinsic symmetries: we can change the eigenvectors by a sign or relabel vertices of the graph, and the model should be invariant or in some cases equivariant with respect to these symmetries. The talk gave an inspiring insight into the mathematics that goes into modern machine learning.

Parallel sessions

On both days, parallel sessions for each of the clusters gave everyone the opportunity to meet up with researchers within their respective fields in mathematics, and share their research results from the past year.

Plenary lecture: Amie Wilkinson

As the closing keynote speaker, Amie Wilkinson gave a gentle introduction to symmetries in dynamical systems. Noether's theorem states that a symmetry in a physical system leads to a conserved quantity in Hamiltonian mechanics, and in modern dynamics this extends to a study of symmetries that includes 'rigidity': a little bit of symmetry implies a lot of symmetry. She also discussed to what extent a dynamical system is determined by its symmetries and closed the session with a conjecture about symmetries in chaotic systems.

This was it for this year. The NMC 2024 was a big success with more than 200 participants. Next year the 60th NMC will be organised, and as every year, it will be a wonderful occasion for Dutch mathematics to meet and share. ↩

All pictures in this report were taken by Marieke Kranenburg.

References

- 1 Geertje Hek en Niels Kolenbrander, Verslag Pythagoras PWS-prijs 2024, *Pythagoras* 63(6) (2024), 12.
- 2 Han Peters, Guus Regts, Een discrete vraag, een complexe oplossing, *Nieuw Archief voor Wiskunde* 5/20(4) (2019), 245–247.
- 3 Nicos Starreveld, In de verdediging: Pjotr Buys, *Nieuw Archief voor Wiskunde* 5/25(1) (2024), 40–42.