



# HCMNEWS 1/24

## Thorsten Beckmann receives the Hausdorff Memorial Award

The Department of Mathematics (Fachgruppe Mathematik) honors **Thorsten Michael Beckmann** with the Hausdorff Memorial Prize for the best dissertation of the academic year 2022/2023 in mathematics. The honor was presented by the chair of the Department, Herbert Koch, on January 30 before the Hausdorff Colloquium in the Lipschitz Hall. In his PhD thesis "Geometry and derived category of holomorphic symplectic vector fields", supervised by Daniel Huybrechts, Thorsten Beckmann investigates various aspects of hyper-Kähler manifolds and abelian varieties such as their derived categories, sheaves, cycles and topology. Thorsten Beckmann studies an important class of algebraic varieties, irreducible holomorphic symplectic varieties. These varieties (also called compact hyperkähler manifolds) are higher dimensional analogues of K3 surfaces. They are simply connected complex projective manifolds with a unique symplectic form, up to scalars. The theory of K3 surfaces has played a decisive role in the history of algebraic geometry, with its unique mix of algebraic and transcendental techniques. Famous conjectures (Weil, Tate) have first been proven for K3 surfaces, often with techniques that turned out to be applicable and crucial in a much broader context. Each section contains interesting, highly original new results in mathematics that could constitute a PhD thesis in algebraic geometry on its own. Taken together, they treat a broad range of problems that are attacked with a richness of original ideas and impressive technical skills. The results are at the forefront of a rapidly moving field. Many of Beckmann's contributions build on recent advances of others, and his thesis contains a lot of material that will be the basis or inspiration for many in the field. Thorsten Beckmann was very productive in the four years of his PhD at an exceptionally high level and impressed with nine papers, some of which have already been published in excellent journals and are very well received. The dissertation consists of six of these papers. This is not the first award that Thorsten Beckmann has received: His Bachelor's thesis "Motivic integration" was already awarded the Bachelor Prize of the Bonn Mathematical Society, and his Master's thesis "Birational geometry of moduli spaces of stable objects on Enriques surfaces" was published in the journal *Selecta Mathematica*. Both theses were also super-

vised by Daniel Huybrechts. Thorsten Beckmann now works as a Data Science Consultant at the pharma & life science company Comma Soft AG in Bonn.

The **Hausdorff Memorial Prize** is awarded in honor of Felix Hausdorff each year around the anniversary of his death, January 26, at the Hausdorff Colloquium. Candidates can be nominated by the professors and lecturers. The decision is made by a jury appointed by the Department of Mathematics. The prize consists of 500 euros in prize money and a book prize.



## HAUSDORFF PEOPLE

## Heinz Gumin Prize for Mathematics goes to Don Zagier

The Carl Friedrich von Siemens Foundation awards the Heinz Gumin Prize for Mathematics to **Don Zagier**, Director Emeritus at the Max Planck Institute for Mathematics in Bonn and Associate Member of the Hausdorff Center for Mathematics. The Foundation hereby honors the prizewinner's groundbreaking research work on number theory and the theory of modular forms. At 50,000 euros, the Gumin Prize is the most highly endowed mathematics prize in Germany. The award ceremony will take place in mid-May 2024 at the Carl Friedrich von Siemens Foundation. Thomas O. Höllmann, Chairman of the Foundation's Board of Directors, summarizes: "With Don Zagier, the 2024 Gumin Prize will once again go to a mathematician who has been outstanding in his specialist fields for decades. In addition to number theory and the theory of modular forms, the prizewinner also conducts research in the field of topology. This fact creates a small commonality with the early work of Heinz Gumin, the prize's name-sake. We would like to thank our expert jury, whose careful selection made this award possible." Don Zagier, born in Heidelberg in 1951, completed his doctorate at the age of 20 in Oxford and habilitated at the University of Bonn. He became Germany's youngest professor in 1976, was a member of the Bonn alma



mater's Collaborative Research Center for Theoretical Mathematics and worked at the University of Bonn from 1976 onwards. In the 1980s, he worked in the L-functions of elliptic curves together with Benedict Gross, which led to the solution of Gauss's general class number problem for imaginary quadratic number fields in 1986. From 1995 to 2019, Don Zagier was one of the directors of the Max Planck Institute for Mathematics in Bonn. Among other awards, he received the Cole Prize in 1987 and the Karl-Georg-Christian-von-Staudt Prize in 2001. The **Heinz Gumin Prize for Mathematics** of the Carl Friedrich von Siemens Stiftung is awarded every three to four years to an outstanding mathematician in Germany, Austria or Switzerland. The prize, which was first awarded in 2010, is named after the mathematician and computer scientist Heinz Gumin (1928 - 2008), who was Chairman of the Board of the Carl Friedrich von Siemens Stiftung for more than 20 years. Two of the four previous winners are also members of the Hausdorff Center for Mathematics: Gerd Faltings in 2010 and Stefan Müller in 2013. Wendelin Werner was honored in 2016 and most recently Wolfgang Hackbusch in 2020.

## Ada Lovelace Prize for Vera Weber

The Institute for Numerical Simulation at the University of Bonn has awarded **Vera Weber** the **Ada Lovelace Prize** for the academic year 2022/2023. The prize was awarded for her master's thesis entitled "On aspects of discretization strategies with applications in imaging", which was supervised by Ira Neitzel. Vera Weber's master's thesis dealt with discretization aspects of the total variation regularization of optimization problems in mathematical image processing. The thematic breadth of Vera Weber's work is outstanding; in particular, aspects of various mathematical topics (functional analysis, optimization, numerics) are incorporated in the theoretical part of her work. The mathematically challenging concepts are exceptionally well described in her work and applied in the field of image processing. Furthermore, the thorough and clear presentation, especially the numerous and concrete literature references, should be emphasized. This is already the second award for Vera Weber, as she had already

received the prize for the best bachelor thesis by a young female scientist in numerics in 2019.





## Christian Bayer Wins ERC Proof of Concept Grant

The economist Professor Christian Bayer from the Institute for Macroeconomics and Econometrics at the University of Bonn and member of the Hausdorff Center for Mathematics (HCM) has received a Proof of Concept (PoC) Grant by the European Research Council (ERC). This program awards researchers €150,000 in funding for up to 18 months to help them commercialize their ideas from previous ERC projects through excellent basic research. The project that has now secured funding, entitled “Bayesian Estimation for Heterogeneous Agent New Keynesian Models” (BASEforHANK), is geared toward developing a software tool for political decision-makers that will show them how planned measures will affect the economy as a whole as well as impact income levels and wealth distribution. This will make it easier for them to understand the consequences of their policies. The tool is based on existing dynamic stochastic general equilibrium (DSGE) models, which can be nowadays found at virtually every political institution. For instance, central banks routinely use these kinds of equilibrium models to assess the impact of their (interest-rate) policy on the economic cycle. However, their structure and their algorithms are largely restricted to scenarios that are predicated on a merely representative budget or company. “This prevents any analysis of economic inequality and questions of distribution, which is a key issue in contemporary economic policy,” says Christian Bayer, who is also a member of two Clusters of Excellence – the Hausdorff Center for Mathematics at the University of Bonn and ECONtribute at the Universities of Bonn and Cologne. “In both Europe and the US, for example, large sums of money were poured into stabilizing the economy during the COVID-19 pandemic. However, the likely impact of these measures was evaluated in the same way as had been done 50 years ago: based on rules of thumb rather than verified economic equilibrium models.” Not all households are hit equally hard by the economic consequences of climate change or the energy crisis either. The only way that political decision-makers will be able to come up with actions that are effective across the board while leaving no-one behind is with instruments that model these heterogeneities. Having an innovative, easy-to-use modeling platform at their fingertips that allows heterogeneous agent New Keynesian (HANK) models to be developed would thus be a real game-changer for the political institutions. However, it would need to be just as quick, versatile and user-friendly as the tools currently available for representative agents while also incorporating inequality-related feedback from political decisions.

The BASEforHANK pilot software is designed to offer this in future and become a key tool in macroeconomic policy-making.



**European Research Council**

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## HAUSDORFF EVENTS

## Commemorative event for Felix Hausdorff

In January, we organized a memorial event for Felix Hausdorff and other Jewish mathematicians in Bonn, in cooperation with the Jewish University Group Bonn and the German-Israeli Society. In his lecture, the mathematics historian Norbert Schappacher traced the life of Felix Hausdorff by also outlining the life of the somewhat younger Jewish mathematician Felix Bernstein and their joint encounters and mathematical achievements. At the end of the lecture, a minute's silence was held in memory of Felix Hausdorff. In his lecture, Walter Purkert focused primarily on Felix Hausdorff's life as a philosopher, writer and essayist. This presentation by the world's leading expert on Felix Hausdorff and editor of the Hausdorff Edition was accompanied by Matthias Kreck on the cello. The event ended with a small poster and book exhibition and many conversations over coffee and kosher food.



## First YAM Network meeting

At the first YAM Network Germany meeting at the HCM, we welcomed ten African YAM Fellows from the four partner institutions and our cooperation partners for an intensive exchange. As reported, our Young African Mathematicians Program (YAM) has now grown into the YAM Network Germany. The network, which is coordinated by HCM, is a cooperation between four German clusters of excellence with a focus on mathematics (Mathematics Münster (MM), MATH+ Berlin, STRUCTURES Heidelberg and HCM) and the African Institute for Mathematical Sciences (AIMS). The aim is to give selected talented AIMS graduates the opportunity to study and conduct research at an excellent mathematical institution in Germany after completing their Master's degree. The network is coordinated by Andreas Eberle and Magdalena Balcerak Jackson, who also supervise the program in Bonn. The collaboration with other German Clusters of Excellence allows us to strengthen the YAM program by organizing two annual networking events that aim to build and foster a strong community among the YAM fellows at the various institutions. In March, the first YAM network meeting took place in Bonn, the place where the YAM Fellowship Program was initiated. Over two days, the ten YAM fellows met, presented the research projects they will continue to work on until the end of their stay in July, received feedback from the supervisors and mentors present and

shared their experiences in Germany in informal discussions. A presentation by Tim Laux, who now teaches at the University of Regensburg but previously coordinated the YAM Fellowship Program in Bonn, enriched the event, which also provided ample opportunity to develop and discuss new ideas for the YAM Network with our cooperation partners from Berlin, Heidelberg and Münster. We look forward to the next network meeting!





## Bonn Math Night

As always, we organized a math night on Pi-Day, March 14. And this time it was once again a pure Bonn Math Night in its original form, that is without the involvement of the other mathematical clusters. The basic format has been constant for four years now: We started in the afternoon with workshops for children and young people. They were held by Stefan Hartmann, Juliane Nordkämper and Antje Kiesel jointly with Nik Oster, followed by exciting talks by Elisabeth Werner, one of the organizers of the current trimester program, on "Floating bodies and Ulam's problem", by Matthias Kreck in top form on "The fourth dimension - a mathematical miracle" and by our Bonn Junior Fellow Johannes Alt on "Bus travel times, atomic nuclei and Riemann's zeta function: Distributions of random matrices are everywhere". A colorful mixture of

pure and applied mathematics! And yet there were also some novelties: For the first time, the Bonn Math Night was organized in a completely hybrid mode. The face-to-face event took place at HIM and was streamed via Zoom. Many math fans arrived at 7 p.m. and stayed until after midnight. Furthermore, this time a personal interview was included in the program instead of a panel discussion. Thoraf Räscher had an entertaining and informative chat with Laura Vargas Koch, another Bonn Junior Fellow, about her research, algorithmic game theory, chip design and her successful past as a judoka and Olympic athlete. Most of those present must have seen an Olympic medal "for real" for the first time.

## Forum for the promotion of talents in mathematics

The „Forum für Begabungsförderung in Mathematik“ (forum for the promotion of talents in mathematics) took place for the 25th time in March and for the first time in Bonn. It was organized by the Verein für Begabungsförderung Mathematik, together with the working group Mathematics and its Didactics and the Bonn Maths Club, with the support of the HCM. Over three days, mathematics didacticians, experts in education and psychology as well as teachers discussed the promotion of gifted children in mathematics and exchanged views on support options for children and young people who are particularly gifted and interested in mathematics. The program included numerous keynote speeches by renowned experts as well as selected short presentations. One highlight of the event was the public lecture "Geometry with rods" by Rainer Kaenders in the main university building. In addition, the event featured a special installment of the Bonn Math Club: a student day for interested children and young people from the Bonn region, from elementary school to high school. Almost 200 pupils, divided

into three age groups, were able to experience exciting mathematics in three consecutive workshops and get their first taste of university. Among the workshop leaders were also Lisa Sauermann and Laurent Côté.



## Kinderuni with Angkana Rüland



For the first time in a long time, we took part in the big Bonn Children's University, which takes place every semester on several Mondays in the Wolfgang Paul lecture hall. In some sense, we organize our own small "children's universities" every Saturday in the Bonn Math Club. At the children's university in February, our Hausdorff Chair Angkana Rüland gave a lecture on shape memory materials and the basic mathematical and physical background. It was a great spectacle with around 300 children who asked lots of clever questions, had great ideas and expressed them in an extremely lively manner. The children's university is a unique event, that you have to experience for yourself. If you would like to give a talk, please get in touch with the HCM outreach team!

## Science rally and “Schnupperuni“

As every year, our school team took part in the science rally and the "SchnupperUni" (a taster university for schoolgirls) at the University of Bonn. At the science rally, over 200 pupils tackled two different mathematical problems at our stations. At the station named "Which shapes can be perfectly connected?", the pupils delved into the world of tessellation and investigated which regular polygons can be used to create a Euclidean plane without gaps or overlaps. They were able to derive the mathematical explanation from their own considerations. At the second station, the question "How do computers put a list in the right order?" was investigated. A sorting algorithm was presented, which was carried out by the pupils using wooden blocks that corresponded to the elements of the list.

Regula Krapf from Bonn's Department of Mathematics took part in the taster university for school girls, which aims to motivate young women to study mathematics and science, with two workshops on "Playful calculation with Hackenbush - Why numbers are nothing more

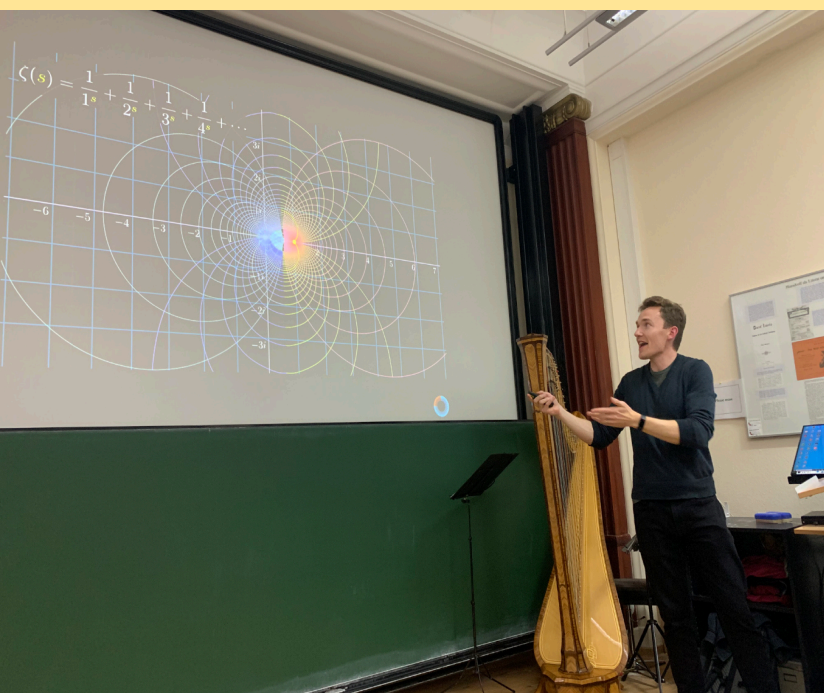
than games", and Laura Vargas Koch participated with a workshop "Insight into algorithmic game theory".



## Grant Sanderson visits Bonn

Here's a little addendum from last year: In November, an extraordinary Mathematical Salon took place with Grant Sanderson, founder of the well-known YouTube channel 3Blue1Brown. Grant Sanderson set off a fascinating firework display of animations and enchanted the audience with a

wonderful presentation. One day later, the mathematics didactics working group organized a panel discussion with Grant Sanderson entitled "The art of educational mathematics videos". Moderated by Thoralf Räscher, Grant Sanderson discussed with Angela Schmitz, mathematics didactics expert at TH Köln and head of the video project StudiVEMINT Videos, and Regula Krapf, Academic Counselor at the Institute of Mathematics and initiator of various video projects with students in Bonn. After a presentation of examples of videos, the panel guests engaged in a lively debate about what exactly makes a good math video, the significance of professionalism, and what role it plays whether a person is visibly featured in the video. Questions relevant to teaching were also discussed, such as how videos can be made interactive and how they can be profitably embedded in mathematics lessons. The event was aimed exclusively at mathematics teaching students, who attended in large numbers and asked many interesting questions. This also provided a look behind the scenes of one of the world's most successful mathematics YouTube channels. It was also finally possible to find out how the name 3Blue1Brown came about: The logo represents Sanderson's right eye, which is three-quarters blue and one-quarter brown.





## Grow@Bonn 2024

On April 4 and 5, 2024, the conference GROW@Bonn 2024 (Graduate Research Opportunities for Women at Bonn) took place at the Max Planck Institute for Mathematics. GROW is a networking conference series for students of all gender identities that are underrepresented in mathematics, especially female students. The aim of the conference was to inform students about master's and PhD programs as well as career paths within and outside academia and to build networks. Students from Germany and other European countries such as the Netherlands, Italy and Switzerland took part in the conference. A particular highlight of the conference was the plenary lecture by Kathryn Hess Bellwald from EPFL in Lausanne, who spoke about her life's journey from both a scientific and personal perspective. In addition to research presentations by Gianne Derks (Leiden), Annette Werner (Frankfurt) and Don Zagier (MPIM), there were also presentations by PhD students, including BIGS PhD candidates Elena Demattè and Luise Puhlmann. In panel discussions on the topics of "What is mathematical research?", "How can you

apply for a master's or PhD program?" and "What can you do with a PhD in mathematics?", the participants received many valuable pieces of advice that can help them plan their academic careers. In addition, the participants also had many opportunities to talk to researchers and to network, for example over lunch in small groups with mentors from Bonn.



As a soon to be graduating master's student, the GROW@Bonn conference provided an ideal platform to gain insights into the career opportunities for women in mathematics during this transitional phase. The diverse panelists offered varied perspectives across different fields, ensuring an engaging and insightful program that was well organized.

(Nida Murad, 5th semester master's student, University of Heidelberg)





## What is ... the SAB?

The **Scientific Advisory Board (SAB)** of the HCM and consists of eight to ten scientists from other international institutions whose research areas represent the various institutes of the HCM. The Executive Board proposes distinguished international mathematicians and economists as members, who are then appointed by the Rectorate for a term of five years. A one-time reappointment is possible. The SAB meets once a year to discuss and decide on the following issues, among others:

- appointment of Bonn Research Chairs,
- selection of HIM trimester programs,
- advice and recommendations on the long-term scientific and structural orientation of the HCM.

Current members of the SAB are:

**Susanne Brenner** has been at the SAB for the INS since 2018. She is a Boyd Professor at Louisiana State University and her research interests include numerical analysis, scientific computing, computational mechanics and variational inequalities.

**Marc Burger**, professor at ETH Zurich, has been working for the MPIM in the SAB. His research focuses on discrete subgroups of Lie groups, geometry of spaces of non-positive curvature and synthetic geometry.

**Serge Cantat**, professor at the Université de Rennes I, has been at the SAB for the MI since 2018. One of his areas of research is complex dynamics and dynamics of automorphisms of algebraic surfaces.

The following trimester programs were selected at the SAB meeting in January 2024:

- **2025, September - December:**  
TP: Definability, decidability, and computability
- **2026, January - April:**  
JTP: Computational multifidelity, multilevel, and multiscale methods
- **2026, May - August:**  
TP: Advances in mechanism design

**Alessio Figalli**, professor at ETH Zurich, joined the SAB for the IAM in 2021. The Italian mathematician has been awarded the Fields Medal and conducts research in calculus of variations and partial differential equations, among other things.

**Michel Goemans**, Leighton Family Professor at MIT and Adjunct Professor at the University of Waterloo, joined the SAB for the DM in 2018. His research focuses on combinatorial optimization.

**Martin Hairer**, professor at EPFL (École Polytechnique Fédérale de Lausanne), has been in his second term for the IAM in the SAB since 2018. He has been awarded the Fields Medal and conducts research in the field of nonlinear stochastic partial differential equations.

**Wolfgang Leininger**, professor emeritus at TU Dortmund University, has been responsible for economics at the SAB since 2020. He specializes in economic theory, game and conflict theory, public choice theory and social choice theory.

**Sylvie Méléard**, professor at the Ecole Polytechnique, has been an interdisciplinary member of the SAB since 2018. Her research interests include probability theory, stochastic processes and mathematical models for ecology and biodiversity.

**Philippe Michel**, professor at EPFL, has been at the SAB for the MI since 2024. He conducts research in the field of analytic number theory, arithmetic geometry and, more recently, ergodic theory.



## IMPRINT

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