Valentin Blomer is new HCM spokesperson

As of March 2023, **Valentin Blomer** is the new spokesperson of the Hausdorff Center for Mathematics. He replaces the interim speaker Stefan Schwede. Many exciting challenges are awaiting Valentin Blomer, such as the follow-up application under the Excellence Strategy, the establishment of numerous new junior researcher programs, and the setting up of new interdisciplinary research units. The entire HCM is looking forward to working with the new spokesperson and thanks Stefan Schwede for his excellent work over the past months.

After studying mathematics and computer science at the University of Mainz, Valentin Blomer received his PhD from the University of Stuttgart in 2002 and habilitated three years later at the University of Göttingen, where he was an assistant professor from 2004 to 2005. He then moved to the University of Toronto, initially as an Assistant Professor, and later received a full professorship there. In 2009 he became a professor at the University of Göttingen, and since 2019 he has been at the University of Bonn. In July 2022, Valentin Blomer received an ERC Advanced Grant with the project "Automorphic Forms and Arithmetic".

New Hausdorff Chair at the HCM: Angkana Rüland

Angkana Rüland has accepted the offer of a Hausdorff Chair. These are professorships for outstanding scientists at the Hausdorff Center for Mathematics (HCM). The 35-year-old, who is herself an alumna of the University of Bonn, is the second woman to hold this position.

Angkana Rüland's research is strongly inspired by problems that arise from the natural sciences and lead to exciting mathematical questions and structures. One example from materials science is the precise analysis of so-called shape memory alloys - special metal alloys that have a "memory" due to their thermodynamic behavior and can seemingly "remember" a previous shape despite severe deformation. "Modeling these materials and analyzing the associated microstructures leads to problems that are fascinating both from an experimental, application-oriented point of view and from an inner-mathematical point of view," says Angkana Rüland.

Another subject of her research are so-called inverse problems, in which one wants to obtain the most accurate information possible about objects through indirect, non-invasive measurements - as is the case, for example, in X-ray tomography. Another example of such an inverse problem are "indirect" navigation systems of animals, bats and dolphins for example.

Commitment to research and teaching

Angkana Rüland brings a team of two doctoral and post-doctoral researchers to the university. "The mathematical environment in Bonn is an internationally outstanding place to work in mathematics in general and in analysis in particular - both in research and in teaching," she says. She is looking forward to an extremely strong and diverse group working in pure and applied analysis. "With a huge range of research seminars, colloquia, international workshops,

summer schools and conferences, and exceptionally motivated and talented students, it's a tremendous opportunity to work in such an inspiring atmosphere."

Angkana Rüland is particularly interested in promoting young talent and, in particular, in the exchange with students. Already in her student days, she was one of the first members of the HCM "school team". There, committed mathematics students strive to make university mathematics comprehensible to school children. In addition, Angkana Rüland was part of the founding team of the Bonn Math Club for children in school grades seven to ten.

Close relationship with Bonn

Angkana Rüland has a close connection to Bonn. She went to school here and she began studying mathematics while still at high school as part of the early study program "FFF - Fördern, Fordern, Forschen" at the University of Bonn. After graduating from high school, she continued her studies at the University of Bonn. In 2014, she completed her doctorate under Herbert Koch at the Mathematical Institute and received the "Hausdorff Memorial Prize" for the best dissertation in mathematics in Bonn.

After her PhD, she went to the University of Oxford as a postdoctoral researcher and subsequently became a junior research group leader at the Max Planck Institute for Mathematics in the Sciences in Leipzig in 2017. In 2020, Angkana Rüland received an appointment at the University of Heidelberg as a W3-professor.

New HCM Managing Director: Magdalena Balcerak Jackson

At the end of February, **Magdalena Balcerak Jackson** moved from the position of Scientific Officer to that of HCM's Managing Director. At Bonn University, she not only earned her master's degree in philosophy, but also worked as a research coordinator before pursuing a successful international academic career in analytic philosophy.

Whether Visiting Lecturer in Davis, USA, Post-Doctoral Fellow in Canberra, Australia, Co-Research Group Leader in Cologne and in Konstanz, Assistant Professor in Miami, USA or Scientific Manager for Doctoral Scholarships at the German National Academic Foundation, Magdalena Balcerak Jackson has acquired a wealth of experience and expertise in research as well as in academic management, and she has demonstrated versatility and flexibility. The promotion of young scientists in an international context and equity and diversity initiatives have always been a central part of her work.

As Managing Director, Magdalena can now tackle the new challenge with the full support of the HCM administration.

Catharina Stroppel new member of the NRW Academy

The North Rhine-Westphalian Academy of Sciences and Arts admitted 14 new members to its ranks at its annual celebration. Among them is Catharina Stroppel.

Catharina Stroppel works in the mathematical field of representation theory with diverse connections, including knot theory and low-dimensional topology. In representation theory, she is concerned with symmetries and their various realizations. Symmetries occur, for example, in physics in the structure of crystals. For her outstanding contributions in this field, she was recently awarded a Gottfried Wilhelm Leibniz Prize by the German Research Foundation (DFG).

The **North Rhine-Westphalian Academy of Sciences and Arts** was founded in 1970. In addition to the sciences, it is the only German academy to integrate the arts under its roof since 2008. Only excellent researchers and artists are admitted. The members cultivate scientific dialog among themselves as well as exchange with research and cultural institutions in Germany and abroad. Only those who, according to the statutes, "have distinguished themselves through scientific or artistic achievements" can be elected. At present, the Academy has around 270 full members and just under 140 corresponding members.

Matthias Kreck Elected Corresponding Member of the Niedersächsische Akademie

Matthias Kreck, Emeritus at the Mathematical Institute in Bonn and active Senior Professor at the University of Frankfurt, was elected Corresponding Member of the "Niedersächsische Akademie der Wissenschaften" in Göttingen.

The N**iedersächsische Akademie der Wissenschaften zu Göttingen** is a non-university research institution with operating centers in ten German states. With its approximately 380 full and corresponding members, the Academy has a unique worldwide network. Being the oldest continuously existing institution of that kind in Germany, the Academy can look back on a long tradition, with a total of 74 Nobel Prize winners, including Werner Heisenberg and Albert Einstein, and other famous members such as Carl Friedrich Gauss, Johann Wolfgang von Goethe, the brothers Jacob and Wilhelm Grimm, and Alexander and Wilhelm von Humboldt.

Matthias Kreck's research focuses on algebraic topology and differential topology. He was director of the Mathematical Research Institute in Oberwolfach for almost a decade and the founding director of our Hausdorff Research Institute for Mathematics (HIM). In 2010 he was awarded the Georg Cantor Medal, and in 2012 he held the Gauss Lecture.
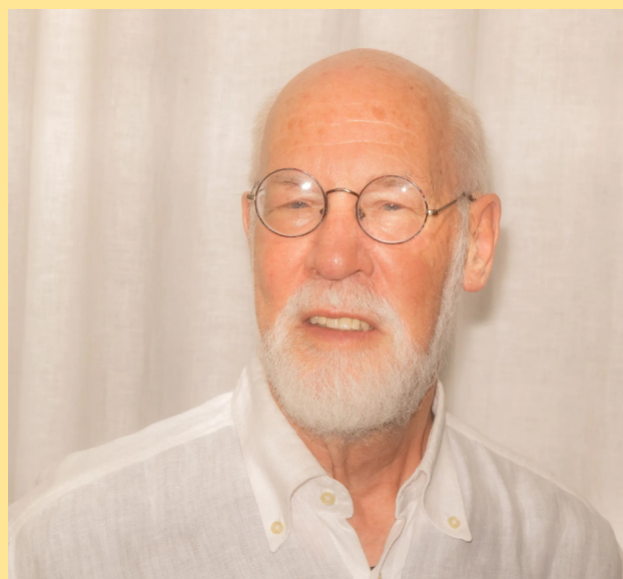
International Conference: Mathematics Meets Life Sciences

In April researchers exchanged views with colleagues from Germany and abroad on the current status and possible future developments at an international conference "Mathematical Life Sciences" at the Wissenschaftszentrum Bonn. The conference "was attended by over 250 participants from institutions in more than 20 countries.

Why mathematics and life sciences? One of the reasons is that the tremendous advances made in experimental life sciences in recent years have provided a wealth of data on how organisms work. Gaining biomedical knowledge from these data, requires both mathematical modelling and methods of numerical analysis in conjunction with experimental data.

In order to get up to date in this comprehensive field of research, the participants of the conference discussed issues from different perspectives. Among other topics, they exchanged ideas on systems biology, integrative pathway modeling, and mathematical image analysis. They also looked at current research in computational immunology as well as chemoinformatics and computational drug design. Other presentations focused on current topics in single cell analysis, mathematical biology, dynamics of cellular and neuronal networks, and computational protein modeling and design.

The conference, which was held internationally for the first time, was jointly organized by the Bonn Clusters of Excellence Hausdorff Center for Mathematics (HCM) and Immuno-Sensation2, the Transdisciplinary Research Areas (TRAs) "Modelling" and "Life and Health", and the three so-called Interdisciplinary Research Units (IRUs) - , headed by Jan Hasenauer, Kevin Thurley and Alexander Effland. In addition, Alena Khmelinskaia from the TRA "Matter" was part of the scientific organizational team.

"The possibilities offered by combining mathematical methods and modeling with the life sciences have only been hinted at in recent years," says Prof. Dr. Jan Hasenauer. "And this applies not only to the new possibilities that are available for answering biomedical questions, but also the other way around - for developing entirely new questions from a different perspective. This new exchange really promotes inspiration."

The conference was followed by a hackathon and a workshop in which everyone interested could take part - good opportunities to work together on new ideas. " With its interdisciplinary nature, this conference promises to be a hub of innovation and collaboration," Jan Hasenauer emphasizes.

European Girls' Math Olympiad: New record for German schoolgirls

Germany's young female mathematicians have never done so well: At the European Girls' Mathematical Olympiad 2023 (EGMO) in Portorož (Slovenia), the German team won two gold and two silver medals. A total of 214 young people from 54 countries took part in the top international tournament for mathematically gifted schoolgirls.

Of the four German starters, Réka Wagener (18) from Siegen achieved the best result and won a gold medal. Vera Lavrovra (17) from Göttingen also won a gold medal. Tina Ding (16, Kempten) and Melia Haase (16, Zschopau) each received a silver medal. Overall, it is the best performance of a German team since the first participation in the tournament in 2018.

The four young mathematicians from the German team qualified for the EGMO as the best female participants in the pre-selection exams for the International Mathematical Olympiad 2023. In two four-and-a-half-hour exams, the female students tackled a total of six complex mathematical problems. The students were accompanied to Slovenia by head of delegation Susanne Armbruster and her deputy Luise Puhlmann, both PhD students at the Bonn Research Institute for Discrete Mathematics.

The European Girls' Mathematical Olympiad (EGMO) is an international mathematics competition for mathematically gifted schoolgirls, which is based on the International Mathematical Olympiad in terms of form and procedure. Since 2012, more than 50 countries from around the world have participated in the junior tournament each year. Each country can send a maximum of four female students to compete. In Germany, the "Bundesweiten Mathematik-Wettbewerbe des Talentförderzentrums Bildung & Begabung" and the Hausdorff Center for Mathematics at the University of Bonn organize the selection and preparation of the German team.

GROW@Bonn 2023

The second edition of the Graduate Research Opportunities for Women workshop (GROW@Bonn 2023) took place at the Max Planck Institute on March 30 and 31. GROW@Bonn is a workshop that aims to provide female, non-binary and gender-diverse students with insights into research careers and job opportunities during and after a PhD in mathematics. Over 50 students from Germany and neighbouring EU countries attended the conference.

The event featured research lectures tailored to undergraduate students, presented by professors and PhD students.

Additionally, there were panel discussions on topics such as what research involves, how to get into a PhD program, and what career paths are available after obtaining a PhD. To top it all off, Karen Vogtmann from the University of Warwick gave an inspiring plenary talk about her experiences as a female mathematician, and the discovery of one of her most influential works, the Culler-Vogtmann Outer space.

Immer up to Date:

All HCM events can be found here: https://www.hcm.uni-bonn.de/events/

Tip for PhD Students:

Here is the newsletter of the Bonn Graduate Center: https://www.uni-bonn.de/en/research-and-teaching/doctoral-students-and-postdocs/events-and-opportunities/newsletter-bonn-doctoral-bulletin-en?set_language=en

HAUSDORFF MIXED

HCM-Retreat

In March, the members of the 10 Research Areas and the IRU "Mathematics and Life Scieces" met for two and a half days in Bad Breisig to inform each other about developments in recent years and to jointly discuss the planned reorientation for the next funding period. First, internal mini-symposia were held within the scientific areas, the results of which were then presented in a large plenary session last year.

Discussions until late in the evening and a joint bowling evening helped to further strengthen the team spirit within the HCM.

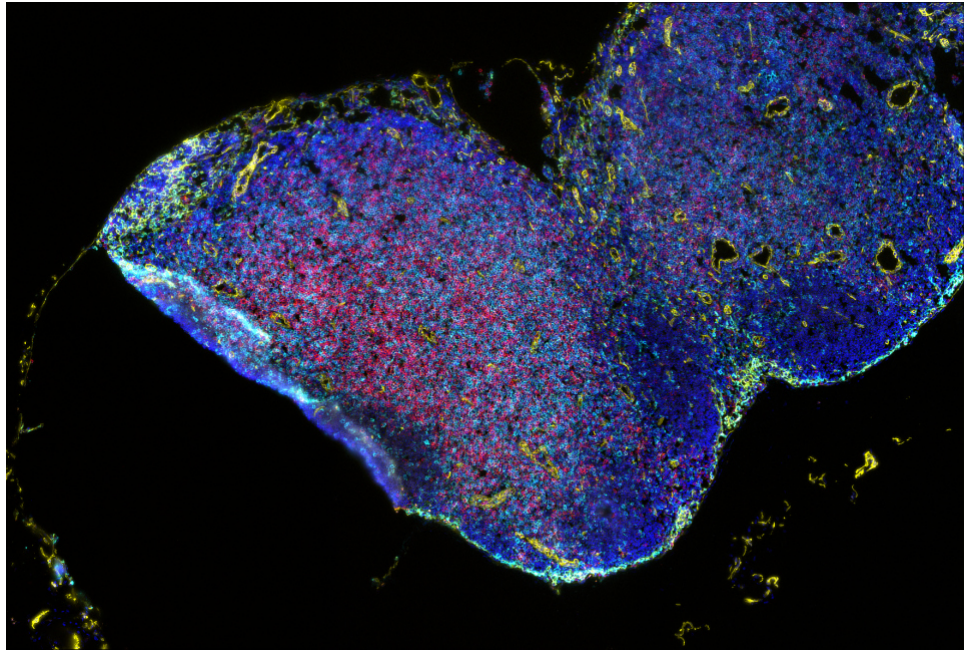# Artificial intelligence to help tumor immunology

The success of cancer treatment depends not only on the type of tumor, but also on the surrounding tissue. Tumors influence it to their advantage, promoting the growth of blood vessels or fooling incoming immune cells. Developing methods to predict the nature of the resulting tumor microenvironment is the goal of researchers from the Clusters of Excellence ImmunoSensation2 and the Hausdorff Center for Mathematics (HCM) led by Kevin Thurley at the University of Bonn. The German Federal Ministry of Education and Research (BMBF) is funding the "InterpretTME" project with around 800,000 euros over the next three years.

Immunotherapy against cancer is not successful in all patients. Resistance to cancer immunotherapies has been shown to be frequently associated with tumor microenvironment (TME) composition. In oncology, the properties of the TME are already being used as biomarkers to make predictions about how a cancer will develop. This is done using imaging techniques that map the type and location of individual cells within the TME. Patterns of gigantic cell assemblies emerge, which in their totality and structure influence the success or failure of cancer immunotherapy. How exactly this works, however, remains elusive." New high-resolution imaging techniques have shown that disease mechanisms are indeed related to details of the spatial arrangement of specific cell types in tissues," notes Kevin Thurley. "Using a combination of mathematical modeling and artificial intelligence methods, we will

investigate these phenomena in detail, in direct collaboration with experimental and clinical research at our University Hospital."

The overall goal of "InterpretTME" is to develop interpretable machine learning (ML) methods for studying complex cellular systems. These are to be used to gain insights into the nature of TMEs. "Machine learning is already used in many places in the hospital to process image data," explains Jan Hasenauer, of the Life & Medical Sciences Institute (LIMES) at the University of Bonn. "We will go one step further and investigate the extent to which information about mechanisms can also be obtained." One aim is to investigate the role that individual immune cell types present in the TME play in the development of different tumor types. In addition, the researchers want to determine what effect chemotherapeutic agents and biological drugs have on the TME of different tumor types.

Three of the scientists involved in this project - Jan Hasenauer, Kevin Thurley, and Alexander Effland - are the group leaders of HCM's Interdisciplinary Research Unit (IRU) Mathematics and Life Sciences.

Math trip of the Bonn Math Club

In the youth hostel Bad Kreuznach, 39 children and teenagers (including about 40% girls) and four adult tutors of the Bonn Math Club had a wonderful weekend. The topic was "Mathematics in Biology". Fibonacci numbers, fractals, population dynamics - these were just some of the many topics we studied extensively for eight hours each in three different age groups. And of course, there was plenty of fun in the form of familiarization games, team competitions and sports!

bonner matheclub

What actually are...
Bonn Research Chairs?

In the next issues of the newsletter, we would like to introduce you to a few terms that you may have heard before, but may not really know what to do with.

Bonn Research Chairs are internationally outstanding scientists who are appointed for a period of 5 years. During this time, they spend about 6 months per year in Bonn to organize events and to advance joint research projects in Bonn. The appointment of the Research Chairs is decided by the Scientific Advisory Board of the HCM on the proposal of the Board of Directors.

Veronique Gayrard is Research Director of the Centre National Recherche Scientifique (CNRS) in France and Bonn Research Chair since 2022. She is a leading scientist in the field of probability theory and statistical physics.

Maria Gordina is a professor at the University of Connecticut and Bonn Research Chair since 2023. She is an expert in the analysis of infinite-dimensional spaces at the interface of stochastic analysis, PDEs, Lie group theory, and quantum field theory.

Michael Ortiz is Adjunct Professor and Distinguished Timoshenko Fellow, at Stanford University and Bonn Research Chair since 2021. He makes outstanding contributions to data-driven material science.

Lillian Pierce is Professor at Duke University. At HCM, she was a Bonn Junior Fellow, then a Bonn Research Fellow, and since 2022, a Bonn Research Chair. She is a leader in both analytic number theory and harmonic analysis.

Alexander Volberg is Professor at the Michigan State University and has been Bonn Research Chair since 2021. His work is in the area of singular integrals, complex analysis, harmonic analysis, and operator theory.

Hanna, Claire + Mathis

News from the Bonn Mathematical Society
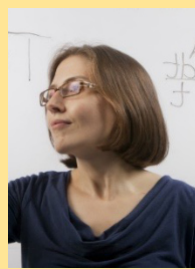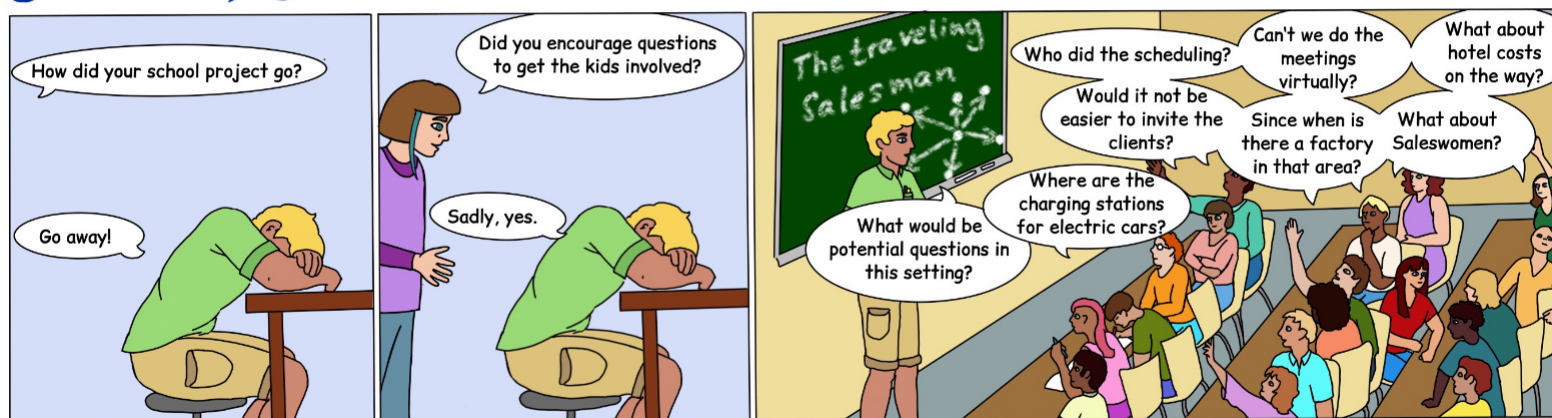
Circus Mathematicus

Who hasn't dreamed of seeing a math professor do acrobatics? Or a horse that calculates better than anyone else in the world? Or experience the famous YouTuber DorFuchs live? Or be enchanted by Albrecht Beutelspacher?

After last year's "Valsche Vorträge Vestival" was very well received, this year the Bonner Mathematische Gesellschaft is organizing a Circus Mathematicus in cooperation with the HCM. The Circus Mathematicus will take place on June 7th at 6:30 pm at the LVR-Landesmuseum Bonn, Colmantstr. 14 - 16e. Admission to the event is free, but we ask for prior registration. More information and a registration form can be found on the website

www.mathematics.uni-bonn.de/mathematik-in-bonn/bmg.

CIRCUS MATHEMATICUS
7. JUNI 2023, 18.30 UHR

LVR-LANDESMUSEUM BONN
COLMANTSTRASSE 14-16 E

Albrecht Beutelspacher, DorFuchs, Gert das rechnende Pferd, Jessica Fintzen, Andreas Steiger, Adel Lombaggine, Knotentanzgruppe, Clown Puòfarlo, Zirkusdirektor Thoralfio