GROW@Bonn 2022: Schedule and information

March 31-April 2, 2022

Thursday, March 31
1415-1515	Registration & coffee
1515-1545	Welcome
1545-1645	Panel discussion: *What is research in mathematics like?* (with Jessica Fintzen, Anke Pohl, Martin Rumpf, Mingjia Zhang)
1700-1800	*Plenary talk*: Ulrike Tillmann

Friday, April 1
0900-0945	*Research talk*: Jessica Fintzen
0945-1015	Coffee
1015-1100	*Research talk*: Eliana Duarte
1115-1200	*Research talk*: Peter Scholze
1200-1400	Lunch & mentoring
1415-1500	*Research talk*: Anke Pohl
1515-1600	*Research talk*: Johan Commelin
1600-1630	Group photo, coffee & cake
1630-1730	Panel discussion: *What to do with a PhD in mathematics?* (with Annette Kolb (cancelled), Regula Krapf, Peter Teichner)

Saturday, April 2
0930-1030	Panel discussion: *Nuts and bolts of applying to masters/PhD programs.* (with Eliana Duarte, Jessica Fintzen, Arunima Ray)
1045-1130	*Research talk*: Margherita Disertori
1145-1230	Goodbye/reception

Practical information

On Thursday evening after the plenary talk 7-8 local participants will accompany you to some local activities. Details will be shared on the Discord server.

On Friday there will be an opportunity to meet local mathematicians over lunch; in small groups of participants coupled with at least one senior mathematician per table. This is an opportunity to informally ask any questions you might have about a career in academia. This will take place at the CAMPO Mensa in Poppelsdorf. Your name tag will provide you with a free lunch.

In order to get access to Mensa, please bring your Covid certificate and proof of ID.

Plenary speaker

Ulrike Tillmann has made notable contributions to the study of moduli spaces of Riemann surfaces and their cohomology, and more recently in the field of topological data analysis. She is professor of mathematics at the University of Oxford. She was awarded the Whitehead Prize by the London Mathematical Society in 2004 and was elected Fellow of the Royal Society in 2008. In 2021, she was named Director of the Isaac Newton Institute, Cambridge and became the president of the London Mathematical Society. Prof. Tillmann has a strong connection to Bonn, having completed her habilitation here.

Speakers and panelists

Johan Commelin is currently a postdoc at the University of Freiburg, in the group of Professor Stephan Kebekus. He obtained his PhD in mathematics in 2017 at the University of Nijmegen, and has spent time at the University of Utrecht as a postdoc. He is interested in algebraic geometry and algebraic number theory, and formal proof verification using computer software.

Margherita Disertori is currently a professor at the University of Bonn. She obtained her PhD in theoretical physics in 1999 at the Ecole Polytechnique in Paris, and has spent time at the Institute for Advanced Study in Princeton, ETH Zürich and the University of Rouen. Her research is in mathematical physics.

Eliana Duarte is currently a junior researcher at the University of Porto. She obtained her PhD in mathematics in 2017 at the University of Illinois Urbana-Champaign, and has spent time at the Max Planck Institute for Mathematics in the Sciences in Leipzig. She is interested in computational algebra and geometry, and algebraic statistics.

Jessica Fintzen is currently a professor at the University of Bonn. She obtained her PhD in mathematics in 2016 at Harvard University, and has spent time at the Institute for Advanced Study in Princeton, the University of Michigan, Cambridge University and Duke University. Her research is in number theory and representation theory.

Annette Kolb obtained her PhD in biology in 1999 at the University of Bielefeld. She was a professor of Biology at the University of Frankfurt until 2014, and is now a professional career coach for junior academics through her company *coachademics*.

Regula Krapf is Akademische Rätin at the University of Bonn. She obtained her PhD in mathematics in 2017 at the University of Bonn, and has spent time at at the University of Koblenz–Landau. She is interested in mathematical logic and undergraduate mathematics education.

Anke Pohl is a professor at the University of Bremen. She obtained her PhD in mathematics at the University of Paderborn, and has spent time in ETH Zürich, the University of Göttingen and the University of Jena. She is interested in dynamic systems, harmonic analysis and analytic number theory.

Arunima Ray is a research group leader at the Max Planck Institute for Mathematics in Bonn. She obtained her PhD in 2014 at Rice University, and has spent time at Brandeis University. She is interested in low-dimensional topology.

Martin Rumpf is a professor at the University of Bonn. He obtained his PhD in 1992 at the University of Bonn. He is interested in numerical methods for partial differential equations and visualisation.

Peter Scholze is a professor at the University of Bonn and a director at the Max Planck Institute for Mathematics in Bonn. He was previously a student at the University of Bonn where he also obtained his PhD in 2012. He received the Fields Medal in 2018 for his work in arithmetic geometry.

Peter Teichner is a director of the Max Planck Institute for Mathematics in Bonn and professor emeritus at the University of California, Berkeley. He obtained his PhD in 1992 at the University of Mainz. His research is in low-dimensional topology and the mathematics of quantum field theory.

Mingjia Zhang is a PhD student at the University of Bonn in the group of Peter Scholze since 2020. She also received her masters degree from Bonn. Her PhD research is in arithmetic geometry.

Abstracts

Johan Commelin: Pushing the limits What can computers tell us about limits in mathematics? And how is mathematics pushing testing some boundaries in computer science? Come to this talk to find out!

Margherita Disertori: Random matrices and history dependent stochastic processes In recent years unexpected connections have been discovered between random matrix models arising in the physical description of disordered materials (Anderson model) and certain history dependent stochastic processes describing self-learning mechanisms (vertex reinforced jump process). I will give a short overview on the models, the mathematical problems involved and some results.

Eliana Duarte: Toric varieties in algebraic statistics and geometric modeling Toric varieties are beautiful objects in Algebraic Geometry whose structure can be studied via their connection to lattice polytopes. They are also varieties that admit a simple parameterization via monomials. Their simple, yet rich structure means that they are versatile objects that appear in many applied settings. In statistics log-linear models are toric varieties. In Geometric Modeling, the connection to polytopes is used to define bases of polynomials whose domains are lattice polytopes and which have useful approximation properties.

In this talk I will explain how understanding properties of toric varieties gives insight into their practical use in Statistics and Geometric Modeling and how the toric geometry language in fact brings these two areas together.

Jessica Fintzen: Filtrations of p-adic groups In this talk I will give a glimpse of my PhD thesis research, my experience as a PhD student, and outline the mathematics that kept me excited since then.

More precisely this talk will be about filtrations of p-adic groups, which play an important role in the representation theory of p-adic groups. I will introduce p-adic numbers, p-adic groups and filtrations thereof defined by Moy and Prasad, and indicate some of their remarkable properties.

I will also survey some of the existing constructions of (supercuspidal) representations of p-adic groups and conclude with recent developments.

Anke Pohl: Resonances of Schottky surfaces Resonances of the Laplacian of Riemannian manifolds are of great importance in many areas of mathematics and physics. Even though many fascinating results about these spectral entities have already been found, an enormous amount of their properties, also some very elementary ones, is still undiscovered. A few years ago, by means of numerical experiments, Borthwick noticed for some classes of Schottky surfaces (certain hyperbolic surfaces of infinite area) that their sets of resonances exhibit unexpected and nice patterns, which are not yet fully understood.

After a brief survey of some parts of this field, we will discuss an alternative numerical method, also motivated by physics, combining tools from dynamics, zeta functions, transfer operators and thermodynamic formalism, functional analysis and approximation theory. The emphasis of the presentation will be on motivation, heuristics and pictures. In particular, no prior knowledge on Schottky surfaces or other Riemannian manifolds, their spectral theory, resonances, etc is assumed. This is joint work with Oscar Bandtlow, Torben Schick and Alex Weisse.

Peter Scholze: Condensed mathematics   One of the most basic notions in mathematics is the notion of a topological space, which formalizes the idea of a space with a notion "nearness" of points. First introduced by Hausdorff in 1914, it has become central in all areas of mathematics. However, in some respects the notion of topological space is not optimal; for example, it can not formalize the idea of "points that are infinitely near but distinct" in a useful way. In 2018, Dustin Clausen came to Bonn, and proposed a certain substitute for topological spaces that we termed condensed sets, and that overcomes these foundational issues. I will try to give an overview of these ideas.

Hygiene rules

Participation in the conference **requires a 2G status**, i.e. all participants must have a complete vaccination or recovery status, as well as a negative rapid test at the beginning of the conference (no older than 24 hours). This will be checked at the registration and will be validated with your name tag in the subsequent days.

Finally, here are the hygiene rules that apply for the duration of the conference:

- Persons with acute cold symptoms will not be admitted to participate.

- A mask must be worn throughout the entire building at Wegelerstraße

- Speakers are exempt from the mask requirement during their talk.

- The mask may be removed briefly during breaks for eating and drinking, as well as for contributions/questions during the lectures and panels.

- Windows are opened during the breaks.