



# hcm NEWS 4/2018



## HAUSDORFF SPECIALS

### Fields Medal for Peter Scholze


Professor of the University Bonn  
receives the highest award of  
mathematics in Brazil

CONGRATULATIONS

**SPECIAL ANNOUNCEMENT: This is the last newsletter in the Initiative of Excellence. From January 2019 forth, the HCM is going to be funded by the federal Excellence Strategy (see later).**

FIELDS MEDAL WINNER

# PETER SCHOLZE


 INTERNATIONAL CONGRESS OF MATHEMATICIANS

**Bonn, 01.08.2018. Professor Dr. Peter Scholze, from the University of Bonn's Hausdorff Center for Mathematics, today received the Fields Medal. It is considered the Nobel Prize for mathematics and is the highest award worldwide a mathematician can receive. The 30-year-old scientist from Bonn accepted the award at the International Congress of Mathematicians in Rio de Janeiro, Brazil.**

Peter Scholze is only the second German to have received the Fields Medal in over 80 years. The first German prize winner was Professor Dr. Gerd Faltings in 1986. He is currently director at the Max Planck Institute for Mathematics in Bonn and board member of the University of Bonn's Hausdorff Center for Mathematics.

The award is the culmination of a multitude of awards and accolades received by Peter Scholze in recent years. His scientific achievements have been recognized by the Clay Foundation's Clay Fellowship, the Prix Peccot awarded by Collège de France, the Clay Research Award, the Cole Prize for Algebra from the American Mathematical Society, and the Leibniz Prize from the German Research Foundation. He has also been accepted into four renowned scientific academies.

## Mathematics at the Intersection of Number Theory and Geometry

Peter Scholze has fundamentally expanded the range of methods used at the intersection of number theory and geometry, so-called Arithmetic Geometry, through his discovery of perfectoid spaces. These new structures make it possible to interpret integers better than before as geometric entities, in which geometry can also be pursued in an environment of primes - via so-called p-adic numbers. Conversely, new, unexpected conclusions about open number-theoretical questions are made possible.

This award for Peter Scholze is another milestone in the long tradition of mathematics in Bonn, which undoubtedly is one of the biggest and most important centers for mathematical teaching and research in Germany and worldwide. Intertwined in its history are great scholars such as Julius Plücker, Felix Klein, Rudolf Lipschitz, Felix Hausdorff and Otto Toeplitz. Friedrich Hirzebruch made Bonn an international center for mathematics in the

## HAUSDORFF SPECIALS

PRESS RELEASES

[www.uni-bonn.de/  
neues/201-2018](http://www.uni-bonn.de/neues/201-2018)

and

[www.hcm.uni-bonn.de/de/  
hcm-news/fields-medal/](http://www.hcm.uni-bonn.de/de/hcm-news/fields-medal/)

Media all over the world reported about this event. Here is a collection of interesting articles:

SPIEGEL ONLINE

**„Peter Scholze bekommt weltweit höchste Auszeichnung für Mathematiker“**

FRANKFURTER ALLGEMEINE

**„Fields-Medaille für Deutschen: Brückenbauer zwischen Geometrie und Zahlen“**

ZEIT ONLINE

**„Fields-Medaille. Gold für Mathegenie Peter Scholze“**

SÜDDEUTSCHE ZEITUNG

**„Höchste Ehrung. Deutscher Mathematiker Peter Scholze erhält Fields-Medaille“**

WELT

**„Peter Scholze gewinnt wichtigsten Mathematikpreis der Welt“**

FOCUS

**„Peter Scholze. Deutscher Mathematiker gewinnt Fields-Medaille“**

SPEKTRUM

**„Algebraische Geometrie. Peter Scholze – der mathematische Hellseher“**

(Übersetzung aus Quanta magazine)

## HAUSDORFF SPECIALS



The rector of the University of Bonn, Michael Hoch (right), traveled with his wife to the ICM in Rio so that they could congratulate Peter Scholze after the distinction together with the HCM coordinator Karl-Theodor Sturm (left).

20th century and founded the Max Planck Institute for Mathematics in Bonn. For decades, the University of Bonn has systematically and sustainably supported and promoted mathematics. Thus, mathematical research forms one of its six key profile areas. Since 2006, the Hausdorff Center for Mathematics has been funded within the framework of the Excellence Initiative by the German federal and state governments as a Cluster of Excellence. This helped make it possible to successfully fund and promote highly talented junior researchers, and to further develop the outstanding environment for mathematical research and teaching at the University of Bonn.

This environment was the decisive reason for Peter Scholze, who comes from Berlin, to choose the University of Bonn as his place of study. Already as a student, he drew attention to his mathematical talent with three gold medals and one silver medal at the International Mathematical Olympiad. The brilliance of the young researcher was recognized worldwide during his doctorate, supervised by academic teacher and mentor, Leibniz award winner Professor Dr. Michael Rapoport. In 2012, the University of Bonn decided to take an extraordinary step. Funded by resources from the Excellence Initiative, the 24-year-old became the youngest W3 professor in Germany and was appointed to a renowned Hausdorff Chair at the Hausdorff Center for Mathematics at the University of Bonn. Since then, he has been courted by the best universities worldwide.

### Great significance for the University of Bonn

The Rector of the University of Bonn, Professor Dr. Dr. h.c. Michael Hoch, emphasizes: „The award and the personal achievement for Peter Scholze is also of great significance to the University of Bonn. Our goal was and is to win the best minds, also and above all outstanding young talents, in respective disciplines for Bonn and to offer them optimal conditions for conducting their research. The exceptional mathematician Peter Scholze is an impressive example of this. Without any doubt, he will continue to shape mathematical research in the future.”

Peter Scholze will continue his research in Bonn: “The conditions here in Bonn are excellent and the international atmosphere is very inspiring,” explains the mathematician. In addition to his Hausdorff Chair at the University’s Mathematical Institute, he was recently appointed as Scientific Director of Bonn’s Max Planck Institute for Mathematics.



DEUTSCHLANDFUNK

„Nobelpreis“ für  
Mathematik.

Der Bonner Mathematiker  
Peter Scholze bekommt  
die Fields-Medaille“

DEUTSCHE WELLE

„Fields-Medaille für  
Bonner Mathematikgenie  
Peter Scholze“

GENERAL-ANZEIGER  
BONN

„Zweiter deutscher  
Preisträger. Goldmedaille  
für Bonner Mathematiker  
Peter Scholze“

KÖLNER STADTANZEIGER

„Bonner Mathematiker  
Peter Scholze ist neuer  
Träger der Fields-Medaille“

FORSCHUNG & LEHRE

„Rio de Janeiro. Bonner  
Mathematiker mit Fields-  
Medaille ausgezeichnet“

DER TAGESSPIEGEL

„Peter Scholze gewinnt  
Fields-Medaille.  
Perfekte Räume in  
Bonn“

FRANKFURTER  
RUNDSCHAU

„Bonner Mathematiker  
Peter Scholze bekommt  
Fields-Medaille“



## HCM renewed for seven more years

We are very happy and proud that the Hausdorff Center for Mathematics was successful in the Excellence Strategy and will be funded for seven more years.

The University of Bonn received with great euphoria the commission's decision to fund six Clusters of Excellence at the University of Bonn – more than any other university in Germany.

The successful Clusters of Excellence at the University of Bonn are:

- **Hausdorff Center for Mathematics:**  
Foundations, Models, Applications
- **ImmunoSensation2:** the immune sensory system
- **Beyond Slavery and Freedom:**  
Asymmetrical Dependencies in Pre-Modern Societies
- **PhenoRob – Robotics and Phenotyping**  
for Sustainable Crop Production
- **ML4Q – Matter and Light for Quantum Computing**  
(together with RWTH Aachen and the University of Cologne)
- **ECONtribute: Markets and Public Policy**  
(together with the University of Cologne)

From January 1, 2019, the Clusters of Excellence will receive funding of up to ten million euros per year for an initial period of seven years. In total, 57 cluster initiatives received funding commitments.

In addition to the Hausdorff Center, the Deutsche Forschungsgemeinschaft will fund three more Clusters of Excellence in mathematics in the future, located at Berlin, Münster and Heidelberg.



[>> Press release of the University Bonn \(in German\)](#)

## Faster computer chips via graph theory

Another „Best Paper Award“ for Discrete Mathematics in Bonn



The Bonn master student Benjamin Rockel and his supervisor Stephan Held, a professor at the Research Institute for Discrete Mathematics, received a Best Paper Award at the Design Automation Conference in San Francisco, a world-leading chip design conference. The work entitled „Exact Algorithms for Delay-Constrained Steiner Arborescences“ deals with the fast, resource-efficient distribution of signals on a chip.

Chip design uses tools from graph theory: directed tree structures, so-called Steiner arborescences. The aim is to optimally distribute the signals using such arborescences. Optimal means that the signal transmission should, of course, be as fast as possible, but also resource-saving regarding power consumption. A partial problem within this method is how to optimally embed a Steiner arborescence in the two-dimensional plane. Here, the work of Benjamin Rockel and Stephan

Held begins: The two Bonn scientists model the problem as a network flow problem in which the edges of the arborescence are loaded with weights (costs). Thus, the search for an optimal tree topology can be improved, and the runtime of the entire algorithm considerably decreases.

### Awarded Paper:

Held, Stephan; Rockel, Benjamin (2018) „Exact Algorithms for Delay-bounded Steiner Arborescences“, *Proceedings of the 55th Annual Design Automation Conference* 44:1-44:6, DOI:10.1145/3195970.3196048

[>> Link to the article](#)

## HAUSDORFF PEOPLE



**Alexey Bufetov** is a new Bonn Junior Fellow at the HCM (IAM). He studied mathematics at Moscow State University until 2011. Afterwards he completed his Ph.D. at the Higher School of Economics (Moscow) in 2015, with the thesis „Random partitions and asymptotic representation theory“. This work contains a central limit theorem for random Young diagrams related to representations of symmetric groups. From 2015 he worked as a C.L.E. Moore Instructor at MIT. His research is devoted to the analysis of probabilistic models coming from representation theory, statistical mechanics, random matrices, and combinatorics. The main goals are to deduce the asymptotic behavior of these models and to better understand their structure.



**Tania Pernas Castaño** is a new postdoctoral researcher in the Functional Analysis group headed by Prof. Juan J.L. Velázquez. Her works centers in the analysis of Partial Differential Equations arising from Fluid Mechanics. She has focused on the local existence of solutions and on the study of finite time singularities for free boundary problems during her PhD. She got her PhD at ICMAT in Madrid under the supervision of Diego Cordoba. Now she is interested in extending her previous work and applying new techniques in other interface problems.



**Georg Oberdieck** who is a new also a new Bonn Junior Fellow at the HCM (MI), completed his studies in mathematics at the ETH Zürich in 2011. In 2015, he received his Ph.D. under the supervision of Rahul Pandharipande, one of the leading experts in modern algebraic geometry, with the thesis „The enumerative geometry of the Hilbert schemes of points of a K3 surface“. Afterwards, he worked at MIT as a C.L.E. Moore Instructor. Georg Oberdieck does research in the field of enumerative geometry of algebraic varieties and their connection to modular forms. The area is one of the most dynamic branches of algebraic geometry, with various relations to symplectic and discrete geometry, but also to number theory and homological algebra.



**Mengxi Zhang** is a new HCM postdoc at the Institute for Microeconomics. Her mentor is Benny Moldovanu. Before coming to Bonn, she did her PhD at Boston University under the supervision of Bart Lipman. Her research interests lie in the areas of Applied Microeconomic Theory and Mechanism Design.



**Jessica Theisen** studies mathematics and french at the University of Bonn in order to become a teacher. Since October she is involved with the public relations of the HCM.

## HAUSDORFF EVENTS

## Excellence Slam

On 27 August 2018 Bonn's two Clusters of Excellence (Immuno Sensation and the Hausdorff Center for Mathematics (HCM)) hosted an open-air science slam in the Arkadenhof of the University of Bonn. Six slammers – three from each cluster - presented their research topics in a humorous and intelligible way to the public.

The competition was moderated by Thoralf Räsch who represented the HCM and David Fußhöller who took up the fight for ImmunoSensation. In the end, the audience voted and Roman Stilling won with his talk „Wer nichts wird, wird Wirt? Wie Bakterien unser soziales Netzwerk knüpfen“.

[>> Click here to see the whole slam](#)



[>> For more photos click here](#)

## HAUSDORFF EVENTS

### Mathematik in Entwicklung

During the last week of August (27. - 31.08.2018) an advanced teacher training („Mathematik in Entwicklung“) was organized by (among others) Rainer Kaenders. Soon-to-be math teachers were offered the opportunity for further development and immersion. During lectures and workshops the participants have been introduced to different areas of research and they were given the opportunity to delve into elementary mathematics, history of mathematics and mathematics principles of teaching.



### Mathematics Week

The Mathematics Week 2018 which was held from 5 to 8 September was a great success again. More than 60 high-school students from different schools attended lectures by Ysette Weiss (Mainz), Rainer Kaenders, Stephan Held and Beate Doerffel. The teenagers could deepen their new knowledge in tutorials that were given by our student assistants. Moreover there were information events and workshops that provided insights into academic mathematics. During the „Speed-Dating“ the high-school students were given the sudden opportunity to talk to the Fields Medalist Peter Scholze.



## HAUSDORFF EVENTS



## Aktionstag Mathematik

On 15 September 2018 the Hausdorff Center for Mathematics opened its doors and fascinated the public with a potpourri of lectures, talks, workshops, hands-on activities, guided tours and exhibitions. All people who are interested in maths could learn or explore new things, and even the little ones were included: Some activities were particularly designed for children and some team members showed them around.

>> [Click here to watch a review of the day.](#)

>> [Click here for more photos.](#)



## Bonn Mathematics Tournament

On 21 September 2018 the Bonn Mathematics Tournament was held again. High-school students and mathematicians dealt with the subject „linear programming and graph optimization“.

The Peter-Joerres-Gymnasium in Ahrweiler stood out of about 380 students from 76 schools. Worth mentioning: The HCM Dream-Team composed of Sergio Conti, Stephan Held, Lisa Onkes, Christoph Thiele and Wiktorija Zatoń reached the highest possible score – for the first time in this competition's history. The special guest Michael Kaiser presented his math songs.

The tournament took place in the Netherlands, Belgium and Germany at the same time, and the winning teams of the three countries are going to go on a trip to Lüttich together.





## HAUSDORFF EVENTS



## Lectures in the context of the 200-years anniversary of the University Bonn

The Hcm took part with numerous lectures in the third quarter „Welt der Zahlen“ in the context of the 200-years anniversary of the University Bonn. Many of them were filmed. In this case we added the link to the video.

09 July 2018

### Opening talk:

#### Das Spiel dauert 90 Minuten – wer rechnet da-mit?

On 9 July 2018 Prof. Dr. Karl-Theodor Sturm and Anna Kraut, BIGS student, talked with Prof. Dr. Andreas Zimmer (Vice Rector for Research and Innovation) about their fascination for mathematics.

10 July 2018

#### Don Zagier: Der Zauber der Zahlen

Prof. Dr. Don Zagier talked amongst others about the nastiest problem in number theory.

11 July 2018

#### Ina Prinz:

#### Alles was zählt – Kulturgeschichte des Rechnens

Prof. Dr. Ina Prinz explained why and where she sees the beauty in maths.

18 July 2018

#### Bernhard Korte:

#### 7 Nanometer and beyond – Mathematik des Chipdesigns

Bernhard Korte explained how algorithms of the discrete mathematics are used in the design of those highly complicated micro processors.

06 August 2018

#### Peter Koepke:

#### Mathematische Theorien unendlicher Zahlen

Peter Koepke presented different degrees of infinity in mathematics.

06 September 2018

#### Rainer Kaenders: Hinterm Komma geht's weiter

Rainer Kaenders amazed with surprising propositions of elementary number theory about repeating decimals and repunits, for example.

10 September 2018

#### Das Spiel mit der Zahl – Spieltheorie

Deszö Szalay from the HCM talked about game theory including many interactive games with the audience.

12 September 2018

#### Sergio Conti:

#### Mathematik von Stäben, Membranen und Origami

Sergio Conti described how deformation – the flexure of bars or the folding of paper – as isometric embeddings can be approximated.

19 September 2018

#### Martin Rumpf: Mathematik im digitalen Filmstudio

Martin Rumpf showed how mathematics helps us to simulate animated objects in a realistic and smooth way, for example.

30 October 2018

#### M3 „Musik x Mathematik x Malerei“

Matthias Kreck (HCM), Luitgard Ilg (paintings) and Michael Allan (piano) combined the diverse art forms.

## HAUSDORFF CALENDAR

**„Der Arzt seiner Ehre“**

A play by Paul Mongré (pseudonym of Felix Hausdorff)

**November 03, 07:00 pm - 08:15 pm****„Der Arzt seiner Ehre“**

A play by Paul Mongré (pseudonym of Felix Hausdorff)

**November 04, 03:00 pm - 04:15 pm****150th anniversary of Felix Hausdorff –  
a commemorative ceremony in the City of Bonn****November 08, 11:00 am - 05:00 pm****Unentscheidbare Probleme in der Mathematik**

Katrin Tent (Universität Münster)

**November 15, 07:00 pm - 8:00 pm****Toeplitz Kolloquium 2018/2019**

David E. Rowe (Mainz)

**November 19, 04:00 pm - 06:00 pm****Hausdorff Kolloquium 2018/2019**

Jean Christophe Mourrat (ENS Paris), Nicolas Bergeron (ENS Paris)

**November 21****Feast of Bonn Mathematics****November 30****Toeplitz Kolloquium 2018/2019**

Peter Bender (Paderborn)

**Dezember 03, 04:00 pm - 06:00 pm**

## HAUSDORFF MIXED

## Peter Scholze becomes honorary member of the London Mathematical Society

During the ICM in Rio de Janeiro, Peter Scholze was affiliated with the London Mathematical Society.



## Thoralf Räsch receives a teaching award of the University of Bonn

Thoralf Räsch was honored with a teaching award of the University of Bonn at the University Festival. He is one of the four awardees of the Faculty of Mathematics and Natural Sciences.

## Shanghai Ranking 2018 – Mathematics and Economics



The University of Bonn ranked 36th in the worldwide Shanghai Ranking in maths. It is thus ranked the best in Germany. This also applies to Bonn's economic sciences that is ranked 35th. In both fields the University of Bonn is the only one in Germany in the top 50 of the ranking.

[Click here to find the press release of the University Bonn.](#)

## New Video on the HCM

In the run-up to the ICM we produced a new image video for the HCM. It was shown in the convention centre in Rio de Janeiro around-the-clock, and we also uploaded it on our website. Thanks to all participants for the excellent collaboration and have fun **watching** the video.

## IMPRESSUM

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